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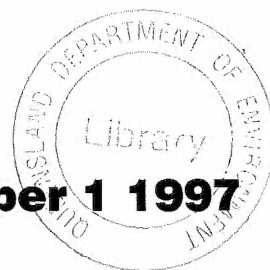
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Application of the phylogenetic species concept: A botanical monographic perspective.

Neil Snow

Summary

Snow, N. (1997). Application of the phylogenetic species concept: A botanical monographic perspective. *Austrobaileya* 5(1): 1–8. The diagnosis of phylogenetic species and infraspecific taxa is considered from the perspective of botanical monography. Diagnosing phylogenetic species using population aggregation analysis (PAA) cannot be done in the herbarium, as it is a population-based procedure. However, herbarium specimens can be aggregated into phylogenetic species based on the presence of fixed characters, and PAA methodology in the field is encouraged to the maximum extent possible. The importance of diagnosing phylogenetic species by ordinary morphological means is stressed. A species is thus an aggregation of sexual or asexual semaphoronts consistently diagnosable by a fixed character or combination of characters recognizable by ordinary morphological means. Application of this species definition will generally decrease species numbers in botanical monographs and could therefore overlook significant but non-fixed phenetic variation. Given the widespread existence of such variation it is concluded that the recognition of infraspecific taxa remains desirable. However, since varieties are explicitly subordinate to subspecies in the Code and imply hierarchical pattern where none is expected to exist, the recognition of only one infraspecific category is recommended.

Keywords: phylogenetics, phylogenetic species, species concepts, subspecies, varieties, botany, monographs.

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We need good theoretical contexts in which to formulate operational interpretations in order to proceed with empiricism. – Estabrook (1972).

Introduction

In the current phylogenetic era the histories of biological lineages have become of paramount importance for interpreting biological pattern and process. The impact of phylogenetic thinking has necessitated a critical re-evaluation of every important concept in systematics (Davis 1995; Harvey et al. 1996; Snow 1996).

For example, the phylogenetic perspective has spawned the concept of phylogenetic species (Nelson & Platnick 1981; Cracraft 1983, 1989; Donoghue 1985), the definition and identification of which have been controversial (Nixon & Wheeler 1990;

de Queiroz & Donoghue 1990b; Wheeler & Nixon 1990). One debate has surrounded 'history' versus 'character' based approaches for diagnosing phylogenetic species (Mishler & Brandon 1987; de Queiroz & Donoghue 1988; Nelson 1989; Nixon & Wheeler 1990; de Queiroz & Donoghue 1990a,b; Baum & Donoghue 1995; Luckow 1995). A second debate has been whether phylogenetic species must be monophyletic (see Crisp & Chandler 1996).

Another recent idea originating from the phylogenetic perspective is a methodological approach by which phylogenetic species can be recognized (Davis & Manos 1991; Davis & Nixon 1992). Termed 'population aggregation analysis' (henceforth PAA) and formulated largely in the context of isozyme data, PAA

tabulates populations for the presence or absence of characters and then iteratively aggregates these populations based on whether characters have gone to fixation (Davis & Nixon 1992; Davis & Goldman 1993).

McDade (1995) recently provided a detailed review of the monographic literature regarding species concepts and their application in practice (see also Hamilton & Reichard 1992). Although other botanists have considered the species problem from the phylogenetic perspective (Crisp & Weston 1993; Crisp & Chandler 1996), only two monographs cited by McDade (1995) (Soreng 1991: 508; Luckow 1993: 38) explicitly used a phylogenetic species concept *sensu* Nixon and Wheeler (1990). To the best of my knowledge, no papers published after the period covered by McDade (1995) addressed either the application of population aggregation analysis (Davis & Nixon 1992) using morphological characters, or the recognition of phylogenetic species in the herbarium. In addition, with the exception of Soreng's (1991) detailed rationale, the issue of recognizing infraspecific taxa under a phylogenetic species concept largely has been overlooked (Luckow 1995).

Having recently completed a phylogenetically-based monograph of the grass genus *Leptochloa* P.Beauv. (Snow 1997) using standard approaches (herbarium, field, greenhouse), I had to consider two issues relevant to the botanical monographer: 1) how to diagnose phylogenetic species relying mostly on herbarium specimens using morphological characters, and 2) the theoretical and pragmatic considerations of whether to recognize infraspecific taxa. I here outline the rationale I followed, and which others may wish to follow, in the hope of stimulating further discussion on these topics.

Phylogenetic species and their recognition in botanical monographs

Under a phylogenetic perspective a monographer may wish to use a phylogenetic species concept (hereafter 'PSC') (Cracraft 1983, 1989; Donoghue 1985; Nixon & Wheeler 1990). A phylogenetic species has been defined

as 'the smallest aggregation of populations (sexual) or lineages (asexual) diagnosable by a unique combination of character states in comparable individuals (semaphoronts)' (Nixon & Wheeler 1990). Contrary to some views (de Queiroz & Donoghue 1988; Vrana & Wheeler 1992), it has been argued that the terms monophyly and paraphyly are not applicable at and below the species level (Nixon & Wheeler 1990; Davis & Nixon 1992). This follows the reasoning of Hennig (1966) that only entities expected to have hierarchical relationships, and not tokogenetic relationships, should be included in cladistic analyses.

An influential paper of Du Rietz (1930: 347) foreshadowed the need for population-based sampling as a necessary empirical antecedent of forming species boundaries. Population aggregation analysis (Davis & Nixon 1992) is not the first time that fixation of characters has been deemed necessary for the recognition of taxa (Davis & Heywood 1973: 78), nor is it the first methodological procedure linked directly to a particular species concept. As the best known example, gene flow and reproductive isolation are linked to the biological species concept, but these criteria are now rarely used in practice to diagnose species boundaries and are thus essentially non-operational (Whittemore 1993; Brookes 1996). In contrast, PAA provides precise methodological criteria by which phylogenetic species can be diagnosed, and in many cases it will be highly operational (but see below). Within the assumptions of the phylogenetic paradigm the logic and methodology of PAA is internally consistent. In many cases, however, the herbarium systematist will be able to apply PAA only under certain constraints.

One constraint of applying population aggregation analysis is that, with the exception of small genera that occur in relatively close proximity to the monographer, PAA will often be logistically infeasible. This is particularly true for species-rich genera and those with intercontinental distributions. Few researchers have adequate time or funding for the necessary travel and intensive population sampling mandated by a strict adherence to PAA methodology. These realities acknowledged,

monographers probably should collect using PAA methodology to the maximum extent possible; that is, sample multiple genotypes for a given population. This is particularly true for problematic species that appear to lack fixed characters or combinations of characters. The data collected from multiple genotypes in a population (hence, independent samples) are systematically informative because they permit analysis of intrapopulational variation, even if its evaluation is non-statistical. Such data are a critical consideration under the phylogenetic species concept, since fixed characters (100% occurrence) at the population level provide the basis by which phylogenetic species are recognized (Crisp & Chandler, 1996). For the herbarium taxonomist, however, the analysis of intrapopulational variation generally has been possible only when species were known from a single locality (e.g., tropical genera such as *Cryptanthus* Otto & A. Dietr. or *Anthurium* Schott.; see Appendix 1).

The second constraint regarding the recognition of phylogenetic species bears on what can happen when the PSC is pushed to its reductionist or aggregationist limits. The use of fixed characters to recognize phylogenetic species may increase (Cracraft 1992) or decrease (Davis & Nixon 1992) the total number of species recognized. As previously argued (e.g., Olmstead 1995), a species could be recognized at the reductionist extreme on the basis of a single fixed nucleotide base pair. However, such a species would not be recognizable by ordinary means. A potential problem at the aggregationist extreme could be the lumping of multiple but phenetically distinct entities due to the absence of any fixed character(s) (see below). Those working with large tropical groups will be keenly aware of this potential problem. An aggregationist extreme also could overlook at least two important considerations in plant biology: 1) the existence of morphological outliers resulting from developmental abnormalities, which are not infrequent in plants, and 2) intermediates due to interspecific hybridization. However, biological reality does not reside within agarose gels or overly rigid theoretical constructs. Meaningful phylogenetic species, to the herbarium systematist, the ecologist,

and the community at large, must be those diagnosable by 'ordinary means' (Cronquist 1978). Thus, the second constraint of PAA methodology is that the monographer must recognize phylogenetic species using ordinary morphological means. To the botanical monographer, a phylogenetic species is an aggregation of sexual or asexual semaphoronts consistently diagnosable by a fixed character or combination of characters recognizable by ordinary morphological means. Users of herbarium-based monographs must realize, however, that additional but cryptic lineages may exist within morphologically based species. In *Leptochloa* an example would be the tetraploid, hexaploid, and octoploid levels occurring in the neotropical species *Leptochloa dubia* (Nees) Kunth (Gould 1975; Snow 1997).

Given the inability to always adhere strictly to the methodology of PAA, yet acknowledging the decided preference for phylogenetic species diagnosable by ordinary means, the best option for the botanical monographer to approximate the recognition of phylogenetic species in the herbarium is to search for a fixed character or suite of characters by which a species can be consistently recognized. The emphasis on fixed (versus polymorphic) characters derives from the fact that only fixed characters are capable of reliably suggesting that the relationships between taxa bearing them will be hierarchical, a necessary assumption of cladistic methodology (Hennig 1966; Davis & Nixon 1992; Doyle 1995). Fixed characters need not be qualitative; quantitative characters showing consistent gaps (and not merely differences in mean values) are also admissible diagnostic features (Thiele 1993; Luckow 1995). The monographer can thus aggregate herbarium specimens into phylogenetic species based on fixed characters observable by ordinary means. This approach is nothing new in monography, other than perhaps the requirement of character fixation. Differences of opinion regarding what constitutes 'ordinary means' will surely exist, but I see no reason to exclude characters that require up to 30x magnification, which is readily available in most herbaria. The aggregation of specimens based on character fixation is a repeatable and testable approach

(Snow 1996) that allows future workers to test hypotheses of species circumscription. With this approach a phylogenetic species is what the data (i.e., the characters) warrant, not merely what a competent systematist says it is.

Using the criteria for recognition of phylogenetic species outlined above, my revision of *Leptochloa* resulted in a decrease in species number (Snow 1997). Application of the PSC using field and herbarium data required merging the Australian taxa formerly known as *Leptochloa ciliolata* (Jedw.) S.T.Blake, *L. decipiens* (R.Br.) Stapf ex Maiden, and *L. peacockii* (Maiden & Betcher) Domin (Lazarides 1980; Stanley & Ross 1989; Wheeler et al. 1990; Simon 1993) into a single species (Snow 1997). The necessity to lump occurred despite the fact that three readily distinguishable entities can exist in considerable numbers sympatrically within a few metres and maintain attributes which, *in that locality*, make them diagnosably distinct (Snow pers. obsv.). However, the attributes by which these taxa have been recognized can also break down in the field (Snow pers. obs.), and significant numbers of intermediates exist as herbarium specimens. Thus, whereas populations can be locally distinct, they may not be globally distinct. Since locally distinct populations not globally fixed for a character or combination of characters still probably reflect underlying genetic variation, it becomes necessary to consider whether infraspecific taxa should be recognized.

The recognition of infraspecific phylogenetic taxa in botanical monographs

Theoretical considerations of infraspecific taxa have been largely overlooked during discussions of species concepts rooted in the phylogenetic paradigm (Luckow 1995). Many (Stebbins 1950; Wilson & Brown 1953; Grant 1981; Mayr 1982) but not all (Du Rietz 1930; Raven 1962; Raven & Raven 1976) pre-cladistic discussions of infraspecific taxa were linked to the 'biological' species concept, or BSC. Reproductive isolation and gene flow, the central tenets of the BSC (Whittemore 1993), cannot be invoked under the phylogenetic paradigm, given its different

assumptions (Luckow 1995). If they are to be recognized, phylogenetic subspecies or varieties, like their 'biological' counterparts, probably will lack consistent criteria for their recognition (Darwin 1859; Grant 1981; but see Pimentel 1959).

Although cladistic approaches are routinely used by population geneticists below the species level to trace gene genealogies (Avice 1989; Crandall & Templeton 1993; Doyle 1995; Maddison 1995; Moritz & Hillis 1996), for the botanical monograph and the phylogenetic analyses on which the supraspecific groups will be based, phylogenetic species are the minimal units of cladistic analysis. However, that does not necessarily make phylogenetic species the minimal taxa. It is possible to formally recognize phenetic taxa below the species level which, unlike phylogenetic species, are not expected to be hierarchically related. This seems particularly defensible if the monographer has field experience with the group, since variation easily detected in the field is frequently not captured on pressed herbarium specimens. For example, in the orchid genus *Cryptocentrum* Benth., leaf phyllotaxis (spiral/distichous), inflorescence position (erect/pendant), and floral bracts (spathaceous/tubular) are diagnostic and fixed characters readily observable in the field, yet are cryptic on herbarium sheets (G. Carnevali pers. comm.).

Returning to the earlier example of *Leptochloa*, application of the phylogenetic species necessitated lumping *L. ciliolata*, *L. decipiens*, and *L. peacockii* into one species. However, given that 1) others have recognized three phenetic entities (Simon 1993; Stanley & Ross 1990); 2) these phenetic entities can be diagnosably distinct sympatrically (Snow pers. obs.); but that 3) their distinctness can also break down in the field (Snow, pers. obs.), I recognized a single species with three subspecies (Snow 1997, in press). Infraspecific taxa can thus be phenetic groupings that presumably reflect genetically-based variation, but the patterns of which are non-fixed and non-hierarchical. Under this approach an infraspecific taxon will still be what a

competent systematist says it is (Hubbell 1954: 120; Hedberg 1957: 14; Raven 1962: 6), although one would hope that newly recognized infraspecific taxa would still be supported with evidence (narrative comment or numerical data) of some sort (Hedberg 1957: 16). My view of infraspecific taxa as phenetic clusters that reflect underlying genetic variation is similar to the species concept outlined by Crisp and Weston (1993), except at a lower taxonomic level.

A question arises then regarding phenetic pattern: Should we formally recognize such pattern at the infraspecific level if it becomes badly blurred or non-diagnosable in a global context? In other words, should an infraspecific taxon be named if the taxonomic placement of some (or all) of its members requires knowledge of their geographical occurrence (du Rietz 1930; Stebbins 1950; Brown & Wilson 1954; Pimentel 1959; Mayr 1982)? For highly vagile organisms, such as the many *r*-selected annual species of *Leptochloa*, it is unreasonable to expect that infraspecific variants will always be restricted to a particular geographic domain (e.g., Snow & Simon in press). Characters, fixed or non-fixed, are heritable and emergent properties of populations or series of populations. Geographical distribution is not a heritable feature and does not necessarily reflect distinct genetic lineages, although it may reflect genetic variation. The actions of mutation, selection, drift, and lineage sorting collectively predict the existence of geographically localized variation in widespread species. If a putative infraspecific taxon cannot be distinguished independent of its geographical occurrence—that is, if no combination of non-fixed characters exists by which a ‘specimen’ can be identified at the infraspecific level—then that taxon should not be recognized. Geographical distribution by itself is an invalid criterion for recognition of infraspecific taxa.

Finally, the monographer must consider how many infraspecific ranks should be recognised. The International Code of Botanical Nomenclature (Greuter et al., 1994) allows for names at two infraspecific ranks: subspecies, and at a subordinate level, varieties. However,

even one infraspecific level of non-fixed phenetic pattern implies fuzzy boundaries between the constituent infraspecific taxa. Under the phylogenetic species concept it is illogical to recognize more than one level of phenetic infraspecific pattern, since variety is subordinate to subspecies, and if both were recognized, it would imply hierarchical pattern where none was expected to exist (Nixon & Wheeler 1990). Complex patterns of variation can certainly occur (Gould & Johnston 1972; Thorpe 1983; Crisp & Chandler 1996), but those inclined to recognize both subspecies and varieties under a phylogenetic species concept using ordinary means might consider whether they are attempting to recognize a degree of *hierarchical* pattern that does not really exist. As noted by others, the recognition of more than one infraspecific rank generally engenders confusion, especially to the non-specialist (Stebbins 1950: 32-33; Hedberg 1957: 15). With these considerations in mind it seems most appropriate to formally recognize only one infraspecific category.

Conclusions

I agree with earlier views (Davis & Goldman 1993; Kellogg 1994; McDade 1995; Luckow 1995) that monographers should clearly outline their species concepts and methodological approaches so that future workers can improve upon extant taxonomies as additional data warrant. Otherwise, successive revisions are merely a chronological array of untestable opinions which, even if based on reliable data, are difficult to evaluate. The exposition presented here represents my own attempts to integrate and pragmatically apply recent theoretical advances in systematics to the writing of a botanical monograph (Snow 1997).

Phylogenetic species are the minimal units amenable to cladistic analysis for the purposes of botanical monography in the phylogenetic perspective. A phylogenetic species is an aggregation of sexual or asexual semaphoronts consistently diagnosable by a fixed character or combination of characters recognizable by ordinary means. A single infraspecific level of non-fixed phenetic variation may be recognized taxonomically

provided the variation is not irretrievably obscured when the species is viewed globally. For the recognition of phylogenetic species fieldwork should focus on the population sampling of separate genotypes for poorly known species, and the populations evaluated using PAA to the maximum extent possible.

The methodology outlined here is not meant to be critical of earlier work. Others will find much to disagree with regarding the logic and rationale outlined above for recognizing species and infraspecific taxa for a phylogenetically-based monograph. However, if this article stimulates further dialogue regarding these topics, particularly in the context of producing scientifically meaningful but useful botanical monographs, it will have served a useful purpose.

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References

- AVISE, J.C. 1989. Gene trees and organismal histories: a phylogenetic approach to population biology. *Evolution* 43: 1192–1208.
- BAUM, D.A. & DONOGHUE, M.J. 1995. Choosing among alternative “phylogenetic” species concepts. *Systematic Botany* 20: 560–573.
- BROOKES, M. 1996. Hybridisation rules OK! *New Scientist* 150: 56.
- BROWN, W.L. Jr., & WILSON, E.O. 1954. The case against the trinomen. *Systematic Zoology* 3: 174–176.
- CRACRAFT, J. 1983. Species concepts and speciation analysis. *Current Ornithology* 1: 159–187.
- 1989. Speciation and its ontology: the empirical consequences of alternative species concepts for understanding patterns of process and differentiation. Pp. 3–27 in *Speciation and its consequences*, eds. D. Otte and J.A. Endler. Sunderland, Massachusetts: Sinauer Press.
- 1992. The species of the birds-of-paradise (Paradisaeidae): applying the phylogenetic species concept to a complex pattern of diversification. *Cladistics* 8: 1–43.
- CRANDALL, K.A. & TEMPLETON, A.R. 1993. Empirical tests of some predictions from coalescent theory with applications to intraspecific phylogeny reconstruction. *Genetics* 134: 959–969.
- CRISP, M.D. & WESTON, P.H. 1993. Geographic and ontogenetic variation in morphology of the Australian waratahs (*Telopea*: Proteaceae). *Systematic Biology* 42: 49–76.
- CRISP, M.D. & CHANDLER, G.T. 1996. Paraphyletic species. *Telopea* 6: 813–844.
- CRONQUIST, A. 1978. Once again, what is a species? *Beltville Symp. Agric. Research* 2: 3–10.
- DARWIN, C. 1859. *On the origin of Species*. John Murray, London.
- DAVIS, J.I. 1995. Species concepts and phylogenetic analysis - Introduction. *Systematic Botany* 20: 555–559.
- DAVIS, J.I., MANOS, P.S. 1991. Isozyme variation and species delimitation in the *Puccinellia nuttalliana* complex (Poaceae): an application of the phylogenetic species concept. *Systematic Botany* 16: 431–445.
- DAVIS, J.I., NIXON, K.C. 1992. Populations, genetic variation, and the delimitation of phylogenetic species. *Systematic Biology* 41: 421–435.
- DAVIS, J.I., GOLDMAN, D.H. 1993. Isozyme variation and species delimitation among diploid populations of the *Puccinellia nuttalliana* complex (Poaceae): character fixation and the discovery of phylogenetic species. *Taxon* 42: 585–599.
- DAVIS, P.H. & HEYWOOD, V.H. 1973. *Principles of Angiosperm Taxonomy*. Huntington: Rober E. Krieger Publishing Company.
- DE QUEIROZ, K. & DONOGHUE, M.J. 1988. Phylogenetic systematics and the species problem. *Cladistics* 4: 317–338.
- 1990a. Phylogenetic systematics or Nelson’s version of cladistics? *Cladistics* 6: 61–75.
- 1990b. Phylogenetic systematics and the species revisited. *Cladistics* 6: 83–90.

- DONOGHUE, M.J. 1985. A critique for the biological species concept and recommendations for a phylogenetic alternative. *The Bryologist* 88: 172–181.
- DOYLE, J.J. 1995. The irrelevance of allele tree topologies for species delimitation, and a non-topological alternative. *Systematic Botany* 20: 574–588.
- DU RIETZ, G.E. 1930. The fundamental units of biological taxonomy. *Svensk Botanisk Tidskrift* 24: 333–428.
- ESTABROOK, G. F. 1972. Cladistic methodology: a discussion of the theoretical basis for the induction of evolutionary history. *Annual Review of Ecology and Systematics* 3: 427–456.
- GOULD, F.W. 1975. *The Grasses of Texas*. Texas A & M University Press, College Station.
- GOULD, S.J. & JOHNSTON, R.F. 1972. Geographic variation. *Annual Review of Ecology and Systematics* 3: 457–498.
- GRANT, V. 1981. *Plant Speciation*. Second Edition. New York: Columbia University Press.
- GREUTER, W., BARRIE, F.R., BURDET, H.M., CHALONER, W.G., DEMOULIN, V., HAWKSWORTH, D.L., JÖRGENSEN P.M., NICOLSON, D.H., SILVA, P.C., TREHANE, P., & MCNEILL, J., 1994. International Code of Botanical Nomenclature (Tokyo Code). *Regnum Vegetabile* 131, Königstein, Germany: Koeltz Scientific Books.
- HAMILTON, C.W. & REICHARD, S.H. 1992. Current practice in the use of subspecies, variety, and forma in the classification of wild plants. *Taxon* 41: 485–498.
- HARVEY, P.H., LEIGH BROWN, A.J., SMITH, J.M., & NEE, S., (eds.). 1996. *New Uses for New Phylogenies*. Oxford: Oxford University Press.
- HEDBERG, O. 1957. Afroalpine vascular plants. A taxonomic revision. *Symbolae Botanicae Upsaliensis* 15: 1–411.
- HENNIG, W. 1966. *Phylogenetic Systematics*. Urbana: University of Illinois Press.
- HUBBELL, T.H. 1954. The naming of geographically variant populations. *Systematic Zoology* 3: 113–121.
- KELLOGG, E.A. 1994. What makes a good monograph? *American Society of Plant Taxonomists Newsletter* 8: 12–15.
- LAZARIDES, M. 1980. The genus *Leptochloa* Beauv. (Poaceae, Eragrostideae) in Australia and Papua New Guinea. *Brunonia* 3:247–269.
- LUCKOW, M. 1993. Monograph of *Desmanthus* (Leguminosae-Mimosoideae). *Systematic Botany Monographs* Vol. 38.
- 1995. Species concepts: assumptions, methods, and applications. *Systematic Botany* 20: 589–605.
- MADDISON, W.P. 1995. Phylogenetic histories within and among species. Pp. 273–287 in P. C. Hoch & A. G. Stephenson (eds.), *Experimental and Molecular Approaches to Plant Biosystematics*. Monogr. Syst. Bot. Missouri Bot. Gard. 53.
- MAYR, E. 1982. *The Growth of Biological Thought: Divergence, Evolution, and Inheritance*. Cambridge: The Belknap Press of Harvard University.
- MCDADE, L.A. 1995. Species concepts and problems in practice: insight from botanical monographs. *Systematic Botany* 20: 606–622.
- MISHLER, B.D., & BRANDON, R.N. 1987. Individuality, pluralism, and the phylogenetic species concept. *Biology & Philosophy* 2: 397–414.
- MORITZ, C., & HILLIS, D.M. 1996. Molecular systematics: context and controversies. Pp. 1–13, in D.M.Hillis, C.Moritz, G.K.Mable (eds.), *Molecular Systematics*, Second Edition. Sunderland, Massachusetts: Sinauer Associates, Inc.
- NELSON, G. 1989. Cladistics and evolutionary models. *Cladistics* 5: 275–289.
- NELSON, G., & PLATNICK, N. 1981. *Systematics and Biogeography: Cladistics and Biogeography*. New York: Columbia University Press.
- NIXON, K.C., & WHEELER, Q.D. 1990. An amplification of the phylogenetic species concept. *Cladistics* 6:211–223.
- OLMSTEAD, R.G. 1995. Species concepts and plesiomorphic species. *Systematic Botany* 20: 623–630.
- PIMENTEL, R.A. 1959. Mendelian infraspecific divergence levels and their analysis. *Systematic Zoology* 8: 139–159.
- RAVEN, P.H. 1962. The systematics of *Oenothera* subgenus *Chylisma*. *University of California Publications in Botany*, Vol. 34: 1–222.
- RAVEN, P.H., & RAVEN, T.E. 1976. The genus *Epilobium* in Australasia. *New Zealand Department of Scientific and Industrial Research, Bulletin* 216.
- SIMON, B.K. 1993. *A key to Australian Grasses*. Second Edition. Brisbane: Queensland Department of Primary Industries.
- SNOW, N. 1996. The phylogenetic paradigm of comparative biology – a response to Hedberg. *Taxon* 45: 85–90.

- 1997. Phylogeny and Systematics of *Leptochloa* P. Beauv. sensu lato (Poaceae, Chloridoideae). Ph.D. Dissertation, Washington University, St. Louis.
- In press. Nomenclatural changes in *Leptochloa* P. Beauv. sensu lato (Poaceae, Chloridoideae). (Novon)
- SIMON, B.K. In press. Australian distribution of the weedy neotropical grass *Leptochloa fusca* subsp. *uninervia*, with an updated key to Australian *Leptochloa* (Poaceae, Chloridoideae). (*Austrobaileya*)
- SORENG, R.J. 1991. Systematics of the 'Epiles' group of *Poa* (Poaceae). *Systematic Botany* 16: 507–528.
- STANLEY, T.D., & ROSS, E.M. 1990. *Flora of south-eastern Queensland*. Volume III. Queensland Department of Primary Industries, Miscellaneous Publication QM88001.
- STEBBINS, G.L. 1950. *Variation and Evolution in Plants*. New York: Columbia University Press.
- THIELE, K. 1993. The holy grail of the perfect character: the cladistic treatment of morphometric data. *Cladistics* 9: 275–304.
- THORPE, R.S. 1983. A review of the numerical methods for recognizing and analyzing racial differentiation. Pp. 404–423 in *Numerical Taxonomy*, (J. Felsenstein, ed.). Berlin: Springer-Verlag.
- VRANA, P., & WHEELER, W. 1992. Individual organisms as terminal entities: laying the species problem to rest. *Cladistics* 8: 67–72.
- WHEELER, D.J.B., JACOBS, S.W.L., & NORTON, B.E. 1990. *Grasses of New South Wales*. Second Edition. Armidale: The University of New England.
- WHEELER, Q.D., & NIXON, K.L. 1990. Another way of looking at the species problem: A reply to de Queiroz and Donoghue. *Cladistics* 6: 77–81.
- WHITTEMORE, A.T. 1993. Species concepts: a reply to Ernst Mayr. *Taxon* 42: 573–583.
- WILSON, E.O., & BROWN, W.L. Jr. 1953. The subspecies concept and its taxonomic application. *Systematic Zoology* 2: 97–111.

Appendix 1. The sampling of numerous genotypes from multiple populations could quickly result in curatorial problems for a given institution. To alleviate curatorial congestion, I suggest a separate collection number be assigned to each genotype and that specimen labels clearly reflect the genotypic uniqueness of each specimen. For example, a numbering scheme for a given population might be *Collector et al.* 7249-A, *Collector et al.* 7249-B, etc., with a statement on the label

reading "Each letter designates a different genotype". Upon completion of the monograph n-1 genotypes from each population could be distributed to other herbaria following standard procedures. An indication on the labels of the herbaria to which duplicates will be distributed would assist future workers. Given its relative ease collectors should also consider collecting fresh leaf material suitable for molecular studies in silica gel.

A taxonomic revision of *Dissiliaria* F.Muell. ex Baill. (Euphorbiaceae)

Paul I. Forster

Summary

Forster, Paul I. A taxonomic revision of *Dissiliaria* F.Muell. ex Baill. (Euphorbiaceae). *Austrobaileya* 5(1): 9–27 (1997). The genus *Dissiliaria* F.Muell. ex Baill. is revised. *Dissiliaria* is endemic to Australia with six species from eastern Queensland, *D. baloghioides* F.Muell. ex Baill., *D. indistincta* P.I.Forst. sp. nov., *D. laxinervis* Airy Shaw, *D. muelleri* Baill., *D. surculosa* P.I.Forst. sp. nov. and *D. tuckeri* P.I.Forst. sp. nov. All species are described and illustrated, with notes on distribution, habitat, typification and conservation status. The names *D. baloghioides* and *D. muelleri* are lectotypified.

Keywords: Euphorbiaceae, *Dissiliaria* - Australia; *Dissiliaria baloghioides*, *Dissiliaria indistincta*, *Dissiliaria laxinervis*, *Dissiliaria muelleri*, *Dissiliaria surculosa*, *Dissiliaria tuckeri*.

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Introduction

The genus *Dissiliaria* was described by Baillon (1867) who recognised two species *D. baloghioides* F.Muell. ex Baill. and *D. muelleri* Baill. Baillon provided descriptions and cited types for the two species he named, but did not provide a formal generic description of his genus although he did extensively discuss its affinities and morphological characters. Airy Shaw (1981) considered that Baillon's account did not constitute formal description; however, other authors (e.g. Bentham 1873; Chapman 1991; Webster 1994) and the compilers of Index Kewensis all considered it to be valid. A third species, *D. laxinervis*, was described by Airy Shaw (1980).

Dissiliaria was included both by Webster (1994) and Levin & Simpson (1994) in Euphorbiaceae subfamily Oldfieldioideae Köhler & Webster, tribe Caletieae Muell.Arg., subtribe Dissiliariinae Pax & K.Hoffm. Other genera included in subtribe Dissiliariinae are *Austrobuxus* Miq., *Canaca* Guillaumin (included with a query in *Austrobuxus* by Levin & Simpson (1994)), *Choriceras* Baill., *Longetia* Baill. ex Muell.Arg., *Sankowskyia* P.I.Forst. and *Whyanbeelia* Airy Shaw & B.Hyland (Levin & Simpson 1994; Webster 1994; Forster 1995). A comparison of macromorphological

characters for genera in the Dissiliariinae, together with a generic key may be found in Forster (1995). The genus *Dissiliaria* is characterised by the plants being dioecious and stipulate; the male flowers having 3+3 sepals, a hairy receptacle, glandular disk absent, 8–26 stamens, anthers oblong, pollen spiny and pistillode absent; the female flowers having 3+3 sepals, a glandular disk present and the styles linear in outline; the fruit globose and having laterally compressed seeds that have an entire caruncle. Anatomical features that distinguish species of *Dissiliaria* from other taxa in the Dissiliariinae according to Hayden (1994) are “high rank venation, well-developed and somewhat oriented areoles, narrow ultimate tracheids in veinlets, fimbrial veins, wavy anticlinal walls of leaf epidermis cells, bundle sheath extensions, and libriform wood fibres”. Based on palynological, vegetative and anatomical characters, Levin & Simpson (1994: 226) produced a cladogram wherein *Dissiliaria* was basal in the Dissiliariinae, and more closely allied to *Austrobuxus* and *Whyanbeelia* than to *Longetia* and *Choriceras*.

All the species of *Dissiliaria* are trees and grow in rainforest communities. Fertile specimens of *Dissiliaria* have proven extremely difficult to acquire as flowering and fruiting is irregular and some of the localities where the

plants occur are difficult to access when they are fertile. This situation was alluded to by Airy Shaw (1981). Nevertheless, there is now considerably more material to review than was available to Airy Shaw. Consequently it is possible to resolve the status of specimens originating from the populations in the McIlwraith Range on Cape York Peninsula that Airy Shaw referred with doubt to *D. muelleri*. These are described as the new species *D. surculosa*. Airy Shaw also included a number of taxa within his concept of *D. laxinervis*. It is now possible to distinguish a further two new species allied to *D. laxinervis* in the strict sense with *D. indistincta* and *D. tuckeri* newly described in this paper. Hence, six species of *Dissiliaria* are recognised in the present account.

The species of *Dissiliaria* readily fall into two groups based on the morphological characters of leaf margin (entire or crenate) and fruits (strongly or weakly trilobate). Crenate leaves and strongly trilobate fruits occur in *D. muelleri* and *D. surculosa* P.I. Forst. Entire leaves and weakly trilobate fruits occur in the remaining species. The occurrence of crenate leaves is considered plesiomorphic and occurs in unrelated taxa in the Oldfieldioideae, although with a preponderance in the Dissiliarinae (Hayden 1994).

The different species of *Dissiliaria* occur in restricted and relictual populations with numerous disjunctions over some 15 degrees of latitude in eastern Queensland. This indicates that the extant species are relatively ancient with distributions fragmented by unfavourable environmental conditions at some time in the past, resulting in their being restricted in present times to refugial niches. Patterns of dispersal are unstudied in detail, but all species exhibit septicidal dehiscence of the capsular fruits followed by ‘drop and roll’ dispersal of the laterally compressed seeds. It is common to see profuse seedling beds beneath large female trees indicating that little lateral movement of seed occurs. In some instances, populations may be found for considerable distances along creeks on alluvia, indicating secondary water transportation of seeds occurs.

Materials and methods

This revision is based on herbarium holdings at BRI, CANB, CBG, NSW, MEL and QRS, photographs of material in BM, G-DC, K and P, and field collections and observations by the author. All specimens have been seen unless indicated n.v. Indumentum cover is described using the terminology of Hewson (1988), except that ‘scattered’ is preferred to ‘isolated’. Indumentum in *Dissiliaria* uniformly comprises simple, multicellular trichomes, thus reinforcing the observations of Hayden (1994) and further refuting those of Rao & Raju (1985).

Conservation codings are allocated using the terminology as defined in the schedules of the Queensland Nature Conservation Act 1992. Rainforest classification follows the scheme proposed by Webb (1978). The ‘Wet Tropics’ is defined as the area of north-eastern Queensland that encompasses the ‘hot, humid vine forests’ from near Cooktown in the north to Paluma in the south (Webb & Tracey 1981; Barlow & Hyland 1988).

Taxonomy

Dissiliaria F. Muell. ex Baill., *Adansonia* 7: 366 (1867). **Type:** *D. baloghioides* F. Muell. ex Baill. lecto, *fide* Webster (1994: 58).

Derivation of name: from the Latin *dissilio* (to fly apart) and *-aria* (resembling or provided with), alluding to the dehiscence of the fruit capsule.

Trees, evergreen, perennial, dioecious; stems and foliage without latex. Indumentum of simple, multicellular trichomes; glandular trichomes absent; stinging trichomes absent. Stipules entire, inconspicuous or conspicuous, deciduous. Leaves opposite, petiolate, elobate, penninerved; margins entire or crenate. Inflorescences axillary, racemose, solitary or fascicled, unisexual with flowers in bracteate clusters. Male flowers pedicellate; sepals imbricate, 3+3; petals absent; receptacle convex; disk absent; stamens 8–26; filaments free, filiform to flattened-filiform, attached to slightly convex receptacle; anthers dorsifixed, bilobate; thecae oblong and longitudinally

dehiscent; pistillode absent. Female flowers pedicellate; sepals imbricate, 3+3; petals absent; disk shortly annular or cupular; ovary 2- or 3-locular; locules biovulate; styles 3, erect, linear-subulate, entire, shortly connate at base.

Fruit capsular, trilobate, with surface smooth to muriculate, dehiscing septicidally into 3 bivalved cocci. Seeds semi-elliptic in outline, laterally compressed; testa crustaceous; albumen fleshy; caruncle entire, non-ariloid; cotyledons broad, flat.

Six species endemic in Australia.

Key to species of *Dissiliaria*

1. Leaves chartaceous, < 9.5 cm long, crenate 2
 Leaves coriaceous, 9.5–18 cm long, entire 3
2. Leaf lamina narrowly elliptic with 17–23 marginal teeth per side of the midrib; tip acuminate; male flower sepals obovate, 0.8–1.2 mm wide **6. *D. surculosa***
 Leaf lamina broadly ovate to rhombic-ovate with 14–16 marginal teeth per side of the midrib; tip acute, obtuse or retuse; male flower sepals broadly elliptic, 1.4–1.5 mm wide **5. *D. muelleri***
3. Stipules lanceolate-obovate; stipular scar 1.8–2.2 mm wide **4. *D. tuckeri***
 Stipules linear or deltoid-lanceolate; stipular scar 0.5–0.8 mm wide 4
4. Stipules linear, c. 4 mm long; interlateral venation prominent below with all connecting veins raised; pedicels 2.5–9 mm long **1. *D. baloghioides***
 Stipules deltoid-lanceolate, 1–1.5 mm long; interlateral venation weakly visible below with only the outer connecting veins raised; female pedicels 10–40 mm long 5
5. New foliage green to pale green-pink; styles c. 6 mm long, erect, connate for 2–2.5 mm; stamens 22–26; anthers 1.3–1.7 mm long **2. *D. laxinervis***
 New foliage bright pink-brown; styles 2.5–4 mm long, strongly recurved, connate for c. 1 mm; stamens 16–18; anthers 0.8–1.2 mm long **3. *D. indistincta***

1. *Dissiliaria baloghioides* F. Muell. ex Baill., *Adansonia* 7: 366 (1867). **Type:** Queensland. MORETON DISTRICT: [label in Leichhardt's hand] "scrub towards the Bunyas, 18/9/1843"; [printed label] Moreton Bay; [label in Leichhardt's hand] "Wood 14....the blackfellows make their boomerangs of it"; [label in unknown hand] "n.328h. Leichhardt Moreton Bay" (lecto [here designated]; P n.v., photo at BRI).

Illustrations: Francis (1981: 131, 132); Hauser (1992: 216).

Tree to 36 m high. Trunk slightly flanged at base. Bark rough, flaky-scaly in patches, grey to grey-brown; blaze pink. Branchlets ± rounded, glabrous or with only scattered trichomes when young, lenticellate with age. Stipules linear, c. 4 mm long and 0.7 mm wide, with scattered trichomes. Leaves glabrous; new foliage pale pink; petioles 4–10 mm long, 0.8–1 mm wide, glabrous; laminas ovate, obovate or elliptic, 50–120 mm long, 15–70 mm wide, coriaceous, with margins entire and venation composed of 8 or 9 lateral veins per side of midrib and interlateral reticulate tertiary veins; upper surface shining

dark green with venation $\pm$ obscure; below glossy pale green with venation prominent with all interlaterals raised; tip acute to obtuse; base attenuate, obtuse or truncate. Male inflorescences in distal axils, up to 7 mm long; peduncles up to 1 mm long; bracts lanceolate, 1–1.5 mm long, 0.4–1.2 mm wide. Male flowers with pedicels 4–12 mm long, 0.5–0.9 mm diameter, with sparse to dense golden trichomes; sepals elliptic, 1.8–4.5 mm long, 1.2–2 mm wide, with sparse trichomes; disk 2–2.5 mm diameter, with dense trichomes; stamens 15–20; filaments 1.5–3.1 mm long; anthers 0.5–1 mm long, 0.3–0.7 mm wide. Female inflorescences in distal axils, of solitary flowers with peduncles obsolete; bracts ovate, c. 2 mm long and 1 mm wide, with sparse trichomes. Female flowers with pedicels 2.5–9 mm long, 1.2–2 mm diameter, with dense golden trichomes; sepals elliptic to ovate, 3–4 mm long, 1.8–2.2 mm wide, with sparse to dense trichomes; ovary 2.5–3 mm diameter, with dense golden trichomes; styles 2.6–3.5 mm long, shortly connate for c. 1 mm in length, strongly recurved, papillose on upper surface, with dense trichomes on lower surface for entire length. Fruits globose, weakly trilobate, 12–21 mm long, 15–22 mm diameter, minutely muriculate; seeds 8–10 mm long, 4.5–5.5 mm wide, 2–2.4 mm thick, smooth, shiny brown. Fig. 1.

Selected additional specimens examined: Queensland. NORTH KENNEDY DISTRICT: Slaty Creek, near Proserpine, Michael 988 (BRI). SOUTH KENNEDY DISTRICT: Cherrytree Creek, Koumala, Nov 1987, Canning 305 (BRI); Foot of ranges W from Koumala, May 1921, Francis [AQ202261] (BRI). PORT CURTIS DISTRICT: Pine Creek, off lower reaches of Granite Creek, S.F. 391 Bulburin, 24°37'S, 151°33'E, Dec 1993, Forster 14580 et al. (BRI); S.F. 67, Bulburin, Sep 1983, Gibson 559 (BRI); Crossing Reserve R73 Miriam Vale, on Baffle Creek, 5 km E of Miriam Vale on road to Agnes Water, Jul 1978, McDonald 2347 & Stanton (BRI, CANB). WIDE BAY DISTRICT: Amamoor, May 1918, Forestry Dept. [AQ202271] (BRI); S.F. 50, 3.5 km S of Mt Urah, 25°52'S, 152°22'E, Nov 1988, Forster 4842 (BRI, CANB, MEL); S.F. 50 Glenbar, 1 km WSW of Mt Urah summit, 25°50'S, 152°20'E, Jan 1993, Forster 13126A & Machin (A, BRI, K, L, MEL, QRS), 13126B (BRI, K, L, MEL, QRS); Kin Kin, Eastern Branch road, 26°18'S, 152°53'E, Feb 1995, Forster 16123A (BRI, MEL, NSW, QRS). MORETON DISTRICT: Bahr's Scrub, S of Beenleigh, 27°43'S, 153°10'E, Jun 1983, Guymer 1857 (BRI, CANB, MEL); 7 km SE of Mt Nebo, Scrub Road, Brisbane Forest Park, 27°25'S, 152°50'E, Sep 1993, Halford Q1842 (BRI); Petrie Creek, West Woombye,

26°40'S, 152°57'E, Apr 1986, Sharpe 4324 & Guymer (BRI); Eumundi, May 1896, Simmonds 470 (BRI); Kelvin Grove, Sep 1920, White & Francis [AQ202263] (BRI); Highvale near Samford, 27°22'S, 152°49'E, Dec 1983, Williams 83091 (BRI).

Distribution and habitat: *D. baloghioides* occurs in the North Kennedy, South Kennedy, Port Curtis, Wide Bay and Moreton districts of Queensland in disjunct populations (Map 1). This species is more widely distributed than stated by Airy Shaw (1981), occurring from the Mt Dryander area in the north to near Brisbane in the south. Plants grow in notophyll vineforests on volcanic substrates derived from granite or rhyolite and are often locally abundant, particularly on creek alluvia.

Notes: Baillon (1867) cited three elements in the protologue of *D. baloghioides*, namely "Leichhardt, n.13, n.14 (1843), Moreton Bay" and "Fitzalan, Pine River, Port Denison". I have not been able to locate the Fitzalan collection, but what appears to be part of the Leichhardt collections is extant at P. This P material has several labels attached, but has the necessary requirements of at least one of the cited numbers (n.14), the correct date (1843) and the correct locality (Moreton Bay). The Leichhardt collection (n.14) is thus selected as lectotype of the name.

Some collections of *D. indistincta* P.I.Forst. from Mt Dryander in the North Kennedy district have been misidentified in herbaria as *D. baloghioides*; however this latter species is easily distinguished by the indistinct interlateral venation in the lower leaf lamina as well as several other features (Table 1). *D. baloghioides* does occur at Mt Dryander but grows in drier communities on the western slopes of the mountain (M.C.Tucker, pers. comm. 1994), whereas *D. indistincta* is common along creeks to the south and south-east of its base.

Phenology: Flowers February to June; fruits February to December.

Conservation status: Widespread, but not common with several populations in conservation reserves (Forster et al. 1991). No conservation coding is thought necessary.

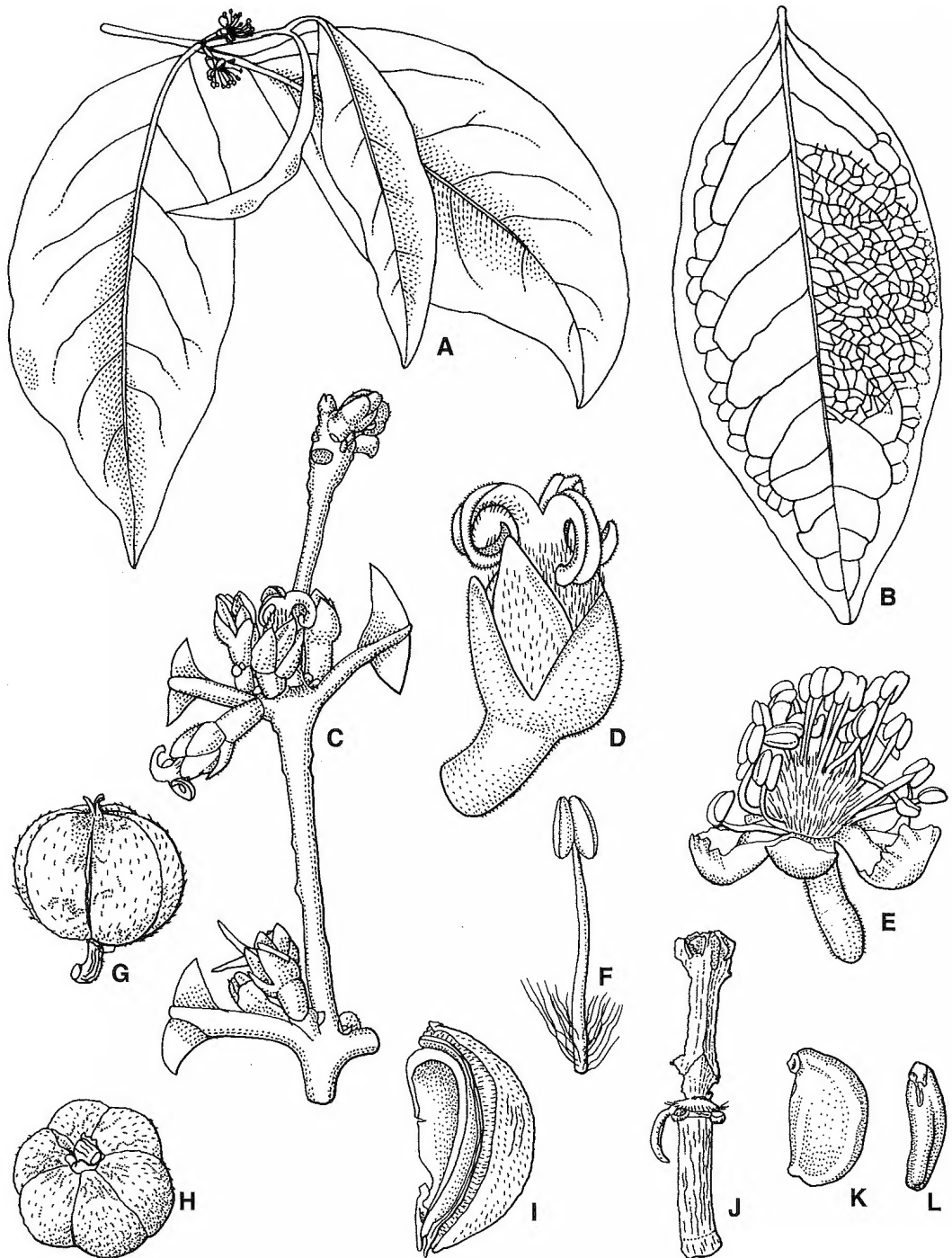


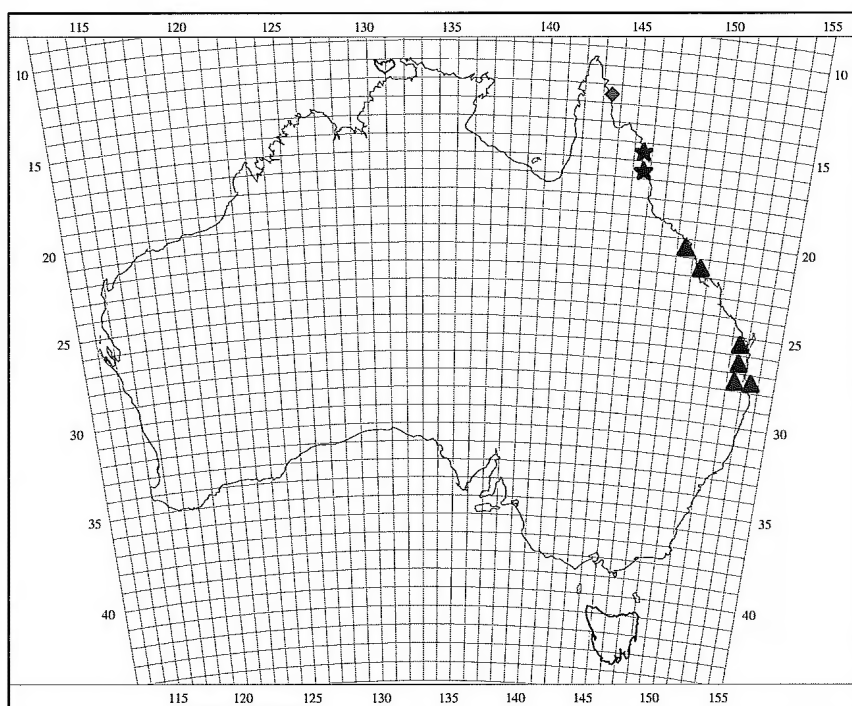
Fig. 1. *Dissiliaria baloghioides*. A. flowering twig $\times 1$. B. detail of adaxial leaf surface $\times 1$. C. female inflorescence $\times 2$. D. female flower $\times 6$. E. male flower $\times 6$. F. stamen $\times 8$. G. lateral view of fruit $\times 1$. H. apical view of fruit $\times 1$. I. one bivalved coccos of fruit $\times 2$. J. persistent columella of dehiscent fruit $\times 2$. K. lateral view of seed $\times 2$. L. ventral view of seed $\times 2$. A,B,E,F from Forster 13126B & Machin (BRI); C,D from Forster 13126A & Machin (BRI); G,H from Smith [AQ316164] (BRI); I-L from Williams 83091 (BRI). Del. W. Smith.

Ethnobotanical use: *D. baloghioides* was reputedly used by aboriginal people in the Bunya Mountains area of south eastern Queensland to make boomerangs (label data with type). There are no extant populations of this species in the Bunya Mountains (cf. Forster et al. 1991) and it is likely that Leichhardt's specimens came from further east, in the Blackall Ranges that were also once referred to as the Bunya Mountains (R.Fensham, pers. comm. 1997).

Etymology: The specific epithet refers to a superficial similarity to what is now known as *Baloghia inophylla* (G. Forst.) P.S.Green.

2. *Dissiliaria laxinervis* Airy Shaw, Muelleria 4: 220 (1980). **Type:** Queensland. Cook DISTRICT: Claudie River, 12°50'S, 143° 20'E, 29 Jun 1972, B. Hyland RFK2578 (holo: K n.v.; iso: BRI, QRS).

Tree to 30 m high. Trunk buttressed at base, not suckering; bark rough and flaky in patches, blaze red. Branchlets ± rounded, glabrous or with a few scattered trichomes when young, lenticellate with age. Stipules deltoid-lanceolate, 1–1.5 mm long, 0.5–0.6 mm wide, glabrous. Leaves glabrous; new foliage green or very slightly pale pink-green; petioles 7–9 mm long, c. 2 mm diameter, channelled on top, glabrous; lamina elliptic, 45–130 mm long, 30–70 mm wide, coriaceous, with margins entire and venation composed of 7 or 8 lateral veins per side of midrib and weakly developed interlateral reticulate tertiary veins; upper surface glossy dark green, with venation ± obscure; lower surface pale green, with venation weakly developed with only the outer interlateral veins raised; tip acute to obcordate; base cuneate to rounded. Male inflorescences in distal axils, ± sessile; bracts triangular, 1–1.2 mm long, c. 0.8 mm wide, glabrous; flowers in glomerules of 4–12. Male flowers with pedicels 22–30 mm long, c. 0.7 mm



Map 1. Distribution of ▲ *Dissiliaria baloghioides*, ◆ *D. laxinervis* and ★ *D. tuckeri*

diameter, glabrous or with scattered hairs; sepals lanceolate-obovate, 4–5 mm long, 2.8–3 mm wide, glabrous or with scattered hairs; disk 3–4 mm diameter, with scattered to sparse short trichomes; stamens 22–26; filaments 1.2–1.8 mm long, c. 0.1 mm diameter, glabrous; anthers 1.3–1.7 mm long, 0.9–1 mm wide. Female inflorescences in distal axils, of solitary flower with peduncle obsolete; bracts lanceolate, c. 1.5 mm long and 0.4 mm wide,

glabrous. Female flowers with pedicels 17–40 mm long, c. 1 mm diameter, glabrous; sepals lanceolate, 2.8–4 mm long, 1.2–2.7 mm wide, glabrous; ovary globose, c. 2 mm long and 2 mm diameter, with dense yellow trichomes; styles c. 6 mm long, shortly connate for 2–2.5 mm at base, erect and with dense trichomes abaxially and shortly papillose apically. Fruits globose, weakly trilobate, 14–18 mm long, 15–18 mm diameter, minutely muriculate; seeds 8–10 mm long, 6.5–7 mm wide, 1.5–2.1 mm thick, smooth, shiny brown. Fig. 2.

Table 1. Comparison of morphological characteristics of entire-leaved species of *Dissiliaria*

Character	<i>D. baloghioides</i>	<i>D. laxinervis</i>	<i>D. tuckeri</i>	<i>D. indistincta</i>
no. of lateral veins per side of leaf lamina midrib	8 or 9	7 or 8	8–10	5–7
stipule shape	linear	deltoid-lanceolate	lanceolate-obovate	deltoid-lanceolate
stipule size (mm)	c. 4 × 0.7	1–1.5 × 0.5–0.6	2.2–4 × 1.8–2.2	1–1.3 × 0.5–0.8
interlateral veins abaxially	prominent	indistinct	indistinct	indistinct
stamen number	15–20	22–26	?	16–18
style length (mm)	2.6–3.5	c. 6	4–4.5	2.5–4
styles	recurved	erect	recurved	recurved
styles connate at base	1 mm	2–2.5 mm	1 mm	0.8–1 mm
female flower pedicel length (mm)	2.5–9	17–40	15–33	10–30
new foliage	pale pink	green or very bright red-pink	bright pale green-pink	pink-brown
petiole dimensions (mm)	4–10 × 0.8–1	7–9 × c. 2	4–8 × 1.5–2.5	3–7 × 1–2

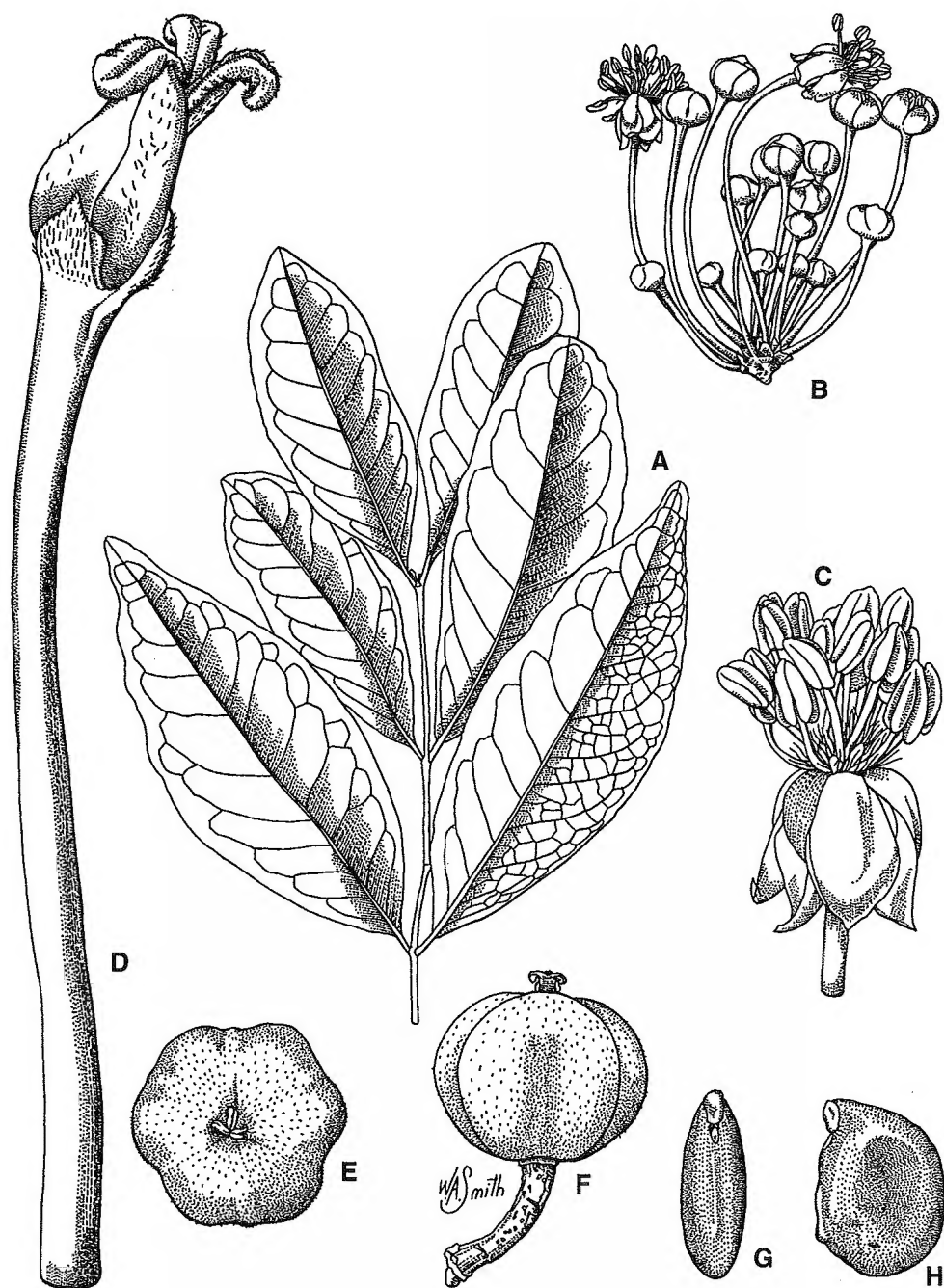


Fig. 2. *Dissiliaria laxinervis*. A. twig $\times 0.4$. B. male inflorescence $\times 1.5$. C. male flower $\times 5$. D. female flower $\times 5$. E. apical view of fruit $\times 1.5$. F. lateral view of fruit $\times 1.5$. G. ventral view of seed $\times 2.5$. H. lateral view of seed $\times 2.5$. A from Forster 13560 (BRI); B,C from Sankovsky 871 (QRS); D from Hyland 11516 (QRS); E–H from Gray 3626 (QRS). Del. W. Smith.

Selected additional specimens examined: Queensland, COOK DISTRICT: Iron Range, 12°46'S, 143°17'E, May 1992, *Cooper & Cooper* 283 (QRS); Claudie River, 4 km ENE of Mt Tozer, Iron Range N.P., 12°44'S, 143°15'E, May 1992, *Fell* 2553 (BRI, QRS); Range 10 miles [16 km] NE of Iron Range, Apr 1944, *Flecker* N.Q.N.C.8689 (BRI, QRS); West Claudie River Scrub, 12°44'S, 143°14'E, Jul 1993, *Forster* 13560 et al. (BRI, MEL); Claudie River, 12°44'S, 143°15'E, Oct 1984, *Gray* 3615, 3626 (QRS); Claudie River, Jan 1982, *Hyland* 11516 (QRS); Claudie River, 12°44'S, 143°14'E, Sep 1988, *Sankowsky* 871 (QRS), 872 (QRS).

Distribution and habitat: *D. laxinervis* is known from a number of populations in the Claudie River catchment to the west of Iron Range on Cape York Peninsula (Map 1). Plants grow along permanent watercourses in mesophyll vineforest on alluvium derived from granite substrates.

Notes: *D. laxinervis* was described by Airy Shaw (1980) based on fruiting material. There is still a dearth of fertile herbarium material for this taxon, although it is now possible to provide descriptions of both male and female flowers here. Airy Shaw included material from the 'Wet Tropics' (1981) and Mt Dryander (annotations at BRI) within his concept of *D. laxinervis*, although he did comment that the collections from Gap Creek in the 'Wet Tropics' may be different. *D. laxinervis* is considered to occur only at Iron Range on Cape York Peninsula, and the southern populations mentioned by Airy Shaw are described in this paper as *D. tuckeri* and *D. indistincta*. They are compared with *D. laxinervis* in Table 1.

Phenology: Flowers have been collected in September and January; and fruits from May to October.

Conservation status: With the narrower circumscription of *D. laxinervis* accepted here, the species is now confined to a single degree square area on Cape York Peninsula. *D. laxinervis* is extremely common in the Claudie River Scrub and many plants are present in Iron Range National Park. No conservation coding is warranted.

Etymology: The specific epithet is derived from the Latin *laxis* (lax) and *nervis* (nerve) and refers to the lax nervation in the leaf lamina of this species.

3. *Dissiliaria indistincta* P.I.Forster, sp. nov.

affinis *D. laxinervi* Airy Shaw a qua frondescencia nova clara rosei-rubra, stylis brevioribus (2.5 – 4 mm longis) valde recurvatis et breviter connatis (per 0.8–1 mm), et floribus masculinis staminibus paucioribus (16 –18) et antheris brevioribus (0.8–1.3 mm longis) differt. **Typus:** Queensland. NORTH KENNEDY DISTRICT: Dryander Creek, left branch, base of Mt Dryander, 20°16'S, 148°34'E, 23 Feb 1994, *P.I. Forster* 14856 & *A.R. Bean* (holo: BRI [3 sheets + spirit]; iso: A, B, BISH, CANB, DNA, G, K, L, MEL, MO, NSW, P, QRS, SING, US).

Tree to 25 m high or occasionally a shrub. Trunk often multistemmed, not buttressed, not suckering; bark rough and flaky in patches; blaze pink. Branchlets ± rounded, glabrous or with a few scattered trichomes when young, lenticellate with age. Stipules deltoid-lanceolate, 1–1.3 mm long, 0.5–0.8 mm wide, glabrous. Leaves glabrous, new foliage bright pink-brown; petioles 3–7 mm long, 1–2 mm wide, channelled on top, glabrous; lamina elliptic, oblanceolate, 30–130 mm long, 10–55 mm wide, coriaceous with margins entire and venation composed of 5–7 lateral veins per side of midrib and weakly developed interlateral reticulate tertiary veins where only the outer veins are raised; upper surface glossy dark green, venation ± obscure; lower surface pale green, venation weakly developed; tip acute to obtuse; base cuneate to rounded. Male inflorescences in distal axils, ± sessile; bracts lanceolate, c. 1.3 mm long and 0.8 mm wide, with scattered hairs; flowers in glomerules of 1–3. Male flowers with pedicels 9–21 mm long, c. 0.6 mm diameter, with scattered hairs; sepals broadly ovate to obovate, 2.8–3 mm long, 2–3 mm wide, glabrous; disk c. 2.5 mm diameter, with sparse to dense hairs; stamens 16–18; filaments 1.7–2.5 mm long, c. 0.2 mm diameter, glabrous; anthers 0.8–1.2 mm long, 0.8–1 mm wide. Female inflorescences in distal axils, of solitary flowers with peduncles obsolete; bracts lanceolate-triangular, 0.8–5 mm long, 0.6–2 mm wide, glabrous. Female flowers with pedicels 10–30 mm long, 0.7–1.2 mm diameter, glabrous; sepals

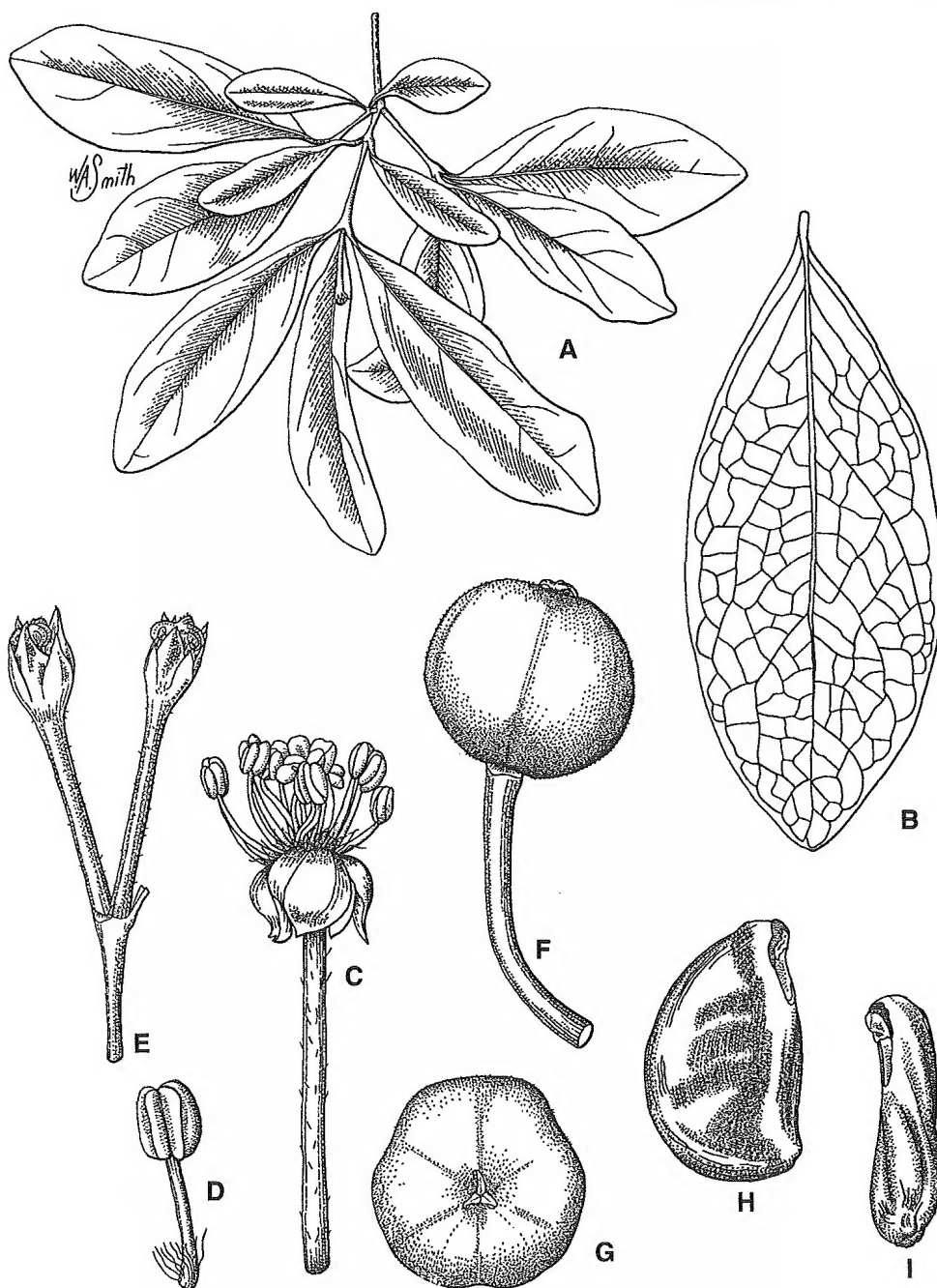


Fig. 3. *Dissiliaria indistincta*. A. flowering twig $\times 0.5$. B. detail of adaxial leaf surface $\times 1$. C. male flower $\times 5$. D. stamen $\times 10$. E. female inflorescence with two flowers $\times 2.5$. F. lateral view of fruit $\times 2.5$. G. apical view of fruit $\times 2.5$. H. lateral view of seed $\times 10$. I. ventral view of seed $\times 10$. A, B, E from *Forster 14856 & Bean* (BRI); C, D from *Forster 14857 & Bean* (BRI); F, G from *Forster 14302* (BRI); H, I from *Sharpe 4175* (BRI). Del. W. Smith.

lanceolate to lanceolate - ovate, 1–5 mm long, 0.5–4 mm wide, glabrous or with scattered hairs at base; ovary subglobose, 3–4.5 mm long, 3–5 mm diameter, with dense golden trichomes; disk annular to irregular cupular, 0.4–2 mm long; styles 2.5–4 mm long, shortly connate for 0.8–1 mm at base, strongly recurved, papillose adaxially, with dense trichomes abaxially for entire length. Fruits subglobose, weakly trilobate, 12–16 mm long, 13–18 mm diameter, minutely muriculate; seeds 5–9 mm long, 3.5–6 mm wide, 1.5–2 mm thick, smooth, shiny brown. Fig. 3.

Selected additional specimens examined: Queensland. NORTH KENNEDY DISTRICT: Hook Island, Nov 1985, *Batianoff* 3601A (BRI); Dugong Inlet, Whitsunday Island, 20°15'S, 148°57'E, Sep 1990, *Batianoff* 900973 & *Batianoff* (BRI); Walkers Creek, Mt Elliot, S of Townsville, 19°35'S, 146°59'E, Aug 1991, *Bean* 3617 (BRI); Station Hill, Cape Upstart Headland, 19°46'S, 147°49'E, Sep 1991, *Cumming* 11376 (BRI); Dryander Creek, left branch, SE slopes of Mt Dryander, 20°16'S, 148°35'E, Jun 1989, *Forster* 5128 & *Tucker* (BISH, BRI, MEL, MO); Dryander Creek, middle branch, SE base of Mt Dryander, 20°16'S, 148°35'E, Jun 1989, *Forster* 5175 & *Tucker* (BISH, BRI, DNA, K, QRS); Emmett Creek, Bowling Green Bay N.P., 19°27'S, 147°03'E, Dec 1993, *Forster* 14307 (BRI, MEL, QRS); ditto, Feb 1994, *Forster* 14883 & *Bean* (A, BRI, L, MEL, QRS); Cape Upstart, 19°42'S, 147°45'E, Oct 1985, *Melville* 592 (BRI); Dryander Creek, c. 2 km N of Gregory & c. 20 km N of Proserpine, 20°24'S, 148°35'E, Nov 1985, *Sharpe* 4175 (BRI); SE foothills of Mt Dryander, May 1969, *Smith* 14526 (BRI, CANB).

Distribution and habitat: *D. indistincta* is restricted to the North Kennedy district of Queensland where it occurs in three 1° grid cells between Townsville and Proserpine (Map 2). Plants grow on alluvium and talus along creeks in complex notophyll to mesophyll vineforests over granite substrates.

Notes: *D. indistincta* may be distinguished from all other species in the genus by the very poorly developed lateral venation in the leaves where only the intramarginal veins are raised on the lower leaf surface. *D. indistincta*, *D. tuckeri* and *D. laxinervis* are closely allied and superficially similar species (Table 1). *D. indistincta* differs from *D. tuckeri* in its smaller, deltoid-lanceolate stipules that leave a stipular scar 0.5–0.8 mm wide, greater number of lateral veins in the leaf lamina (8–10) that are also more poorly developed, and shorter styles

(2.5–4 mm long). *D. indistincta* differs from *D. laxinervis* in the colour of its new foliage (bright pink-brown), generally shorter petioles, the shorter styles (2.5–4 mm long) that are strongly recurved and shortly connate (for 0.8–1 mm), and its male flowers with fewer stamens (16–18) and shorter anthers (0.8–1.3 mm long).

Phenology: Flowers February to June; fruits several months later. Flowering is extremely erratic and appears to be stimulated by heavy rainfall in the summer wet season.

Conservation status: *D. indistincta* is very common where it occurs and is known to be present in National Parks at Mt Elliot and Cape Upstart. No conservation coding is thought necessary.

Etymology: The specific epithet is derived from the Latin *indistinctus* (indistinct) and alludes to the poor development of lateral veins in the leaf lamina of this species.

4. *Dissiliaria tuckeri* P.I. Forst., sp. nov. affinis *D. laxinervi* Airy Shaw a qua frondescentia nova clara rosei-rubra, stipulis magnioribus lanceolati-obovatis (2.2–4 mm longis) cicatrice 1.8–2.2 mm lata, et stylis brevioribus (4–4.5 mm longis) valde recurvatis differt. **Typus:** Queensland. COOK DISTRICT: Gap Creek, c. 22 miles [36.7 km] SE of Cooktown, May 1969, *L.S. Smith* 14419 (holo: BRI; iso: NSW).

Illustration: Christophel & Hyland (1993: 102, t. 40E); Cooper & Cooper (1994: 97) [as *D. laxinervis*].

Tree to 30 m high. Trunk buttressed at base, rarely multistemmed, not suckering; bark rough, flaky in patches, blaze pink. Branchlets ± rounded, glabrous or with a few sparse trichomes when young, lenticellate with age. Stipules lanceolate-obovate, 2.2–4 mm long, 1.8–2.2 mm wide, glabrous. Leaves glabrous, new foliage usually bright red-pink; petioles 4–8 mm long, 1.5–2.5 mm wide, channelled on top, glabrous; lamina elliptic, oblanceolate, 60–170 mm long, 30–75 mm wide, coriaceous, margins entire, venation composed of 8–10

lateral veins per side of midrib and weakly developed interlateral reticulate tertiary veins with only the outer veins raised; upper surface dark glossy green, venation weakly developed; lower surface matt light green, venation weakly developed; tip acute, acuminate, obtuse, rounded; base cuneate or rounded. Male inflorescences and flowers not seen. Female inflorescences in distal axils; female flowers 1 or 2 per axil with peduncles 2–4 mm long; bracts not seen. Female flowers (not seen at anthesis) with pedicels 15–33 mm long, glabrous; styles 4–4.5 mm long, connate for c. 1 mm at base, strongly recurved, papillose adaxially top and with sparse trichomes abaxially for entire length. Fruits subglobose, weakly trilobate, 13–15 mm long, c. 18 mm diameter, minutely muriculate; seeds c. 9 mm long, 7 mm wide and 1.5–2 mm thick, smooth, shiny brown. Fig. 4.

Selected additional specimens examined: Queensland.

COOK DISTRICT: Noah Creek, 3 km upstream from road, 16°08'S, 145°25'E, Aug 1987, *Christophel* [QRS 084689] (QRS); Gap Creek, Cedar Bay N.P., 15°49'S, 145°19'E, Jun 1992, *Forster* 10729 et al. (BRI); Little Cooper Creek, Daintree Freehold Rainforest, 16°10'S, 145°24'E, Jul 1994, *Forster* 15558 (BRI, QRS); Cape Tribulation N.P., Noah Creek, 16°08'S, 145°25'E, Sep 1991, *Gray* 5315 (QRS); 13.2 km S of Rossville on Bloomfield road, lowlands below Mt Finnegan, Dec 1989, *Jessup* GJD3086 et al. (BRI); Daintree, Nov 1959, *Manthey* 1777 (BRI); Gap Creek, 15°45'S, 145°10'E, May 1969, *Smith* 14372 (BRI); Bloomfield, 15°57'S, 145°20'E, May 1969, *Volck* 4290 (BRI); The Gap, between Rossville & Ayton, Jun 1973, *Webb & Tracey* 13709 (BRI).

Distribution and habitat: *D. tuckeri* is known from several disjunct populations in two 1° grid squares in the 'Wet Tropics' of Cook district of north Queensland (Map 1). Plants grow in complex mesophyll vineforest on rocky alluvia derived from granite substrates along permanent watercourses.

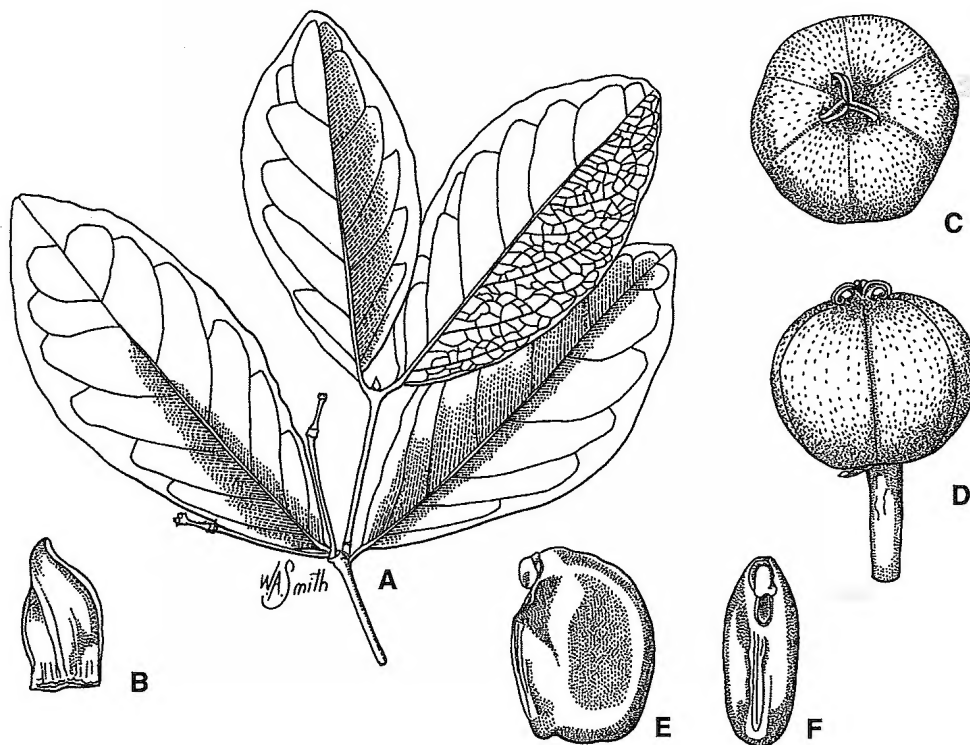


Fig. 4. *Dissiliaria tuckeri*. A. twig $\times 0.5$. B. stipule $\times 5$. C. apical view of fruit $\times 1.5$. D. lateral view of fruit $\times 1.5$. E. lateral view of seed $\times 2.5$. F. ventral view of seed $\times 2.5$. A, B from Smith 14419 (BRI); C–F from Gray 5315 (QRS). Del. W. Smith.

Notes: *D. tuckeri* is closely allied to *D. laxinervis* and the two species may be difficult to distinguish with incomplete herbarium material (see Table 1 for comparison). *D. laxinervis* has green to greenish pale pink new foliage; 1–1.5 mm long deltoid-lanceolate stipules that leave a scar 0.5–0.8 mm wide, generally shorter leaves (45–130 mm long), and longer styles (c. 6 mm long) that are held erect. *D. tuckeri* has bright pink-red new foliage; 2.2–4 mm long lanceolate-obovate stipules that leave a scar 1.8–2.2 mm wide; generally longer (mainly oblanceolate) leaves (60–170 mm long) and shorter styles (4–4.5 mm long) that are strongly recurved. There also appear to be some differences in the seedlings of these two species (based on limited data). Seedlings of *D. tuckeri* have cotyledons that are more or less sessile and 22–23 mm long, whereas *D. laxinervis* has cotyledons that are shortly petiolate (c. 2 mm long) and 26–30 mm long.

The populations of *D. tuckeri* at the type locality of Gap Creek have much larger stipules than those from the Daintree area, but whether this is correlated with other morphological differences remains to be seen. There appear to be some differences in seedlings from the two areas (G. Sankowsky, pers. comm. 1994) but the evidence remains inconclusive at this stage. To determine whether or not *D. tuckeri* encompasses two taxa requires examination of fertile collections of male and female flowers! These have proved impossible to procure to date.

Conservation status: *D. tuckeri* is present in Cedar Bay National Park at the foothills of Mt Finnegan (Gap Creek) and in Cape Tribulation National Park at Noah Creek, but is still unreserved at Cooper Creek. The Cooper Creek population is under immediate threat due to residential development in one of the most diverse and species-rich areas of lowland rainforest north of the Daintree River. A conservation coding of 2VC as defined by the *Queensland Nature Conservation Act* 1992 is recommended.

Etymology: The specific epithet honours Maurie C. Tucker of Booval, Ipswich who has a keen interest in Australian rainforest plants

and has explored many patches of rainforest and scrub with the author.

5. *Dissiliaria muelleri* Baill., *Adansonia* 7: 359 (1867). **Type:** Queensland. PORT CURTIS DISTRICT: Rockhampton, *Thozet* (lecto [here designated]: P. n.v., photo at BRI).

Illustration: Baillon (1867: plate 1).

Tree to 10 m high. Trunk not buttressed, not suckering or only if damaged, but often multistemmed. Bark rough, flaky in patches, light to rich brown; blaze pink. Branchlets $\pm$ rounded, with short sparse trichomes when young, soon glabrescent and lenticellate with age. Stipules lanceolate, 0.8–1.4 mm long, 0.4–0.6 mm wide, glabrous or with scattered trichomes. Leaves glabrous; petioles 1–4 mm long, c. 0.5 mm wide; laminas broadly ovate to rhombic-ovate, 8–95 mm long, 6–65 mm wide, chartaceous, with prominent yellow venation comprising 7 to 9 laterals per side of midrib and weakly developed interlateral reticulate veins; upper surface glabrous, glossy green, venation $\pm$ obscure; lower surface glabrous, pale green, venation prominent; margins shallowly crenulate to subentire, with 14–16 teeth per side; tip acute, obtuse or retuse; base cuneate, obtuse, truncate. Male inflorescences 1–few-flowered in distal axils; peduncles 1–3 mm long, glabrous; bracts lanceolate to ovate, 1.4–2 mm long, 0.5–1.8 mm wide, glabrous. Male flowers with pedicels 2.5–7 mm long, c. 0.4 mm diameter, glabrous; sepals broadly elliptic, 1.5–2 mm long, 1.4–1.5 mm wide, glabrous or ciliate; receptacle c. 2 mm diameter, with sparse to dense trichomes and numerous small glands; stamens 8–16; filaments filiform, 0.9–1.8 mm long, c. 0.1 mm diameter; anthers 0.5–1 mm long, 0.3–0.8 mm wide. Female inflorescences (1–)3-flowered, up to 15 mm long; peduncles 4–10 mm long, 0.7–0.8 mm diameter, glabrous; bracts lanceolate to oblanceolate, 0.8–1.5 mm long, 0.3–0.8 mm wide, glabrous. Female flowers with pedicels 1.5–10 mm long, 0.7–1.2 mm diameter, glabrous; sepals broadly elliptic to ovate, 1.8–7.5 mm long, 1.2–3 mm wide, glabrous; disk annular to cupular, surrounding the base of the ovary; ovary subglobose, 1.3–4 mm diameter, with sparse trichomes; styles very shortly connate, subulate, erect to

slightly recurved, 2–3.2 mm long, with sparse trichomes at base. Fruits subglobose, strongly trilobate, 8–9 mm long, 10–15 mm diameter, with scattered to sparse trichomes, yellow-green. Seeds 4.8–5.5 mm long, 3.7–4.5 mm wide, 2–2.2 mm thick, smooth, shiny red-brown. Fig. 5.

Selected additional specimens examined: Queensland. PORT CURTIS DISTRICT: Rockhampton, *Dallachy* [MEL 532391] (MEL); Mt Larcom, 23°48'S, 151°04'E, Jan 1988, *Forster* 3372 & *Gibson* (BRI, QRS); ditto, Jan 1994, *Forster* 14640 (BRI, MEL, QRS); Moores Creek E.P., Beserker Range, 23°19'S, 150°33'E, Jan 1993, *Forster* 12713 (BRI, L, MEL, QRS); Moores Creek, 23°20'S, 150°35'E, Oct 1976, *Hyland* 9084 (BRI, QRS); Archer Creek near Rockhampton, Jul 1935, *White* 12142 (BRI). WIDE BAY DISTRICT: Graphite Mine road, Guyra Range, Mt Bauple area, 25°47'S, 152°34'E, Dec 1992, *Forster* 12519A & *Smyrell* (BRI, K, L, MEL, QRS), 12519B (BRI, K, L, MEL, QRS); ditto, Jan 1994, *Forster* 14629 (BRI); c. 1 km N of Mt Bauple, 25°49'S, 152°35'E, Dec 1982, *Gymer* 1834 & *Dillewaard* (BRI); Mt Bauple, 27 miles [45 km] N from Gympie, Dec 1923, *Kajewski* [AQ202281] (BRI); Gundiah, Dec 1923, *Kajewski* [AQ202279] (BRI).

Distribution and habitat: *D. muelleri* is known from three localities, Mt Archer near Rockhampton, Mt Larcom and Mt Bauple (Map 2), all in central and south-east Queensland (Forster et al. 1991). Plants grow in semi-evergreen microphyll vine thickets and araucarian microphyll vineforests on volcanic substrates of volcanic origin.

Notes: Baillon cited two syntypes for *D. muelleri*, *Thozet* 391 and *Dallachy* 429, both collected from the Rockhampton area. I have been able to locate unnumbered collections from the Rockhampton area of both these collectors in MEL and P. The Thozet collection at P is the better collection and hence is selected as lectotype of the name.

Sterile collections from the McIlwraith Range area in Cook district have been referred to this species in the past (e.g. Airy Shaw 1981); however, these belong to a distinct taxon named *D. surculosa* in this paper.

Phenology: Flowers from December to January; fruits January to February.

Conservation status: *D. muelleri* is a restricted endemic that is locally abundant in the three general localities where it occurs. Parts of two

of these populations are in conservation reserves (Mt Bauple National Park & Mt Archer Conservation Park), but the Mt Larcom population is unreserved. No conservation coding is considered necessary at this stage.

6. *Dissiliaria surculosa* P.I. Forst., sp. nov. affinis

D. muelleri Baill. a qua caulibus juvenibus dense lenticellatis, foliis anguste ellipticis et dentibus utroque latere 17–23 et apice acuminato, et sepalis florum marium obovatis et 0.8–1.2 mm latis differt. **Typus:** Queensland. COOK DISTRICT: Timber Reserve 14 Massy, 13°52'S, 143°23'E, 8 Nov 1980, *B. Hyland* 10882 (holo: QRS; iso: BRI).

Dissiliaria sp. RFK#2554 (Hyland & Whiffin 1993, 2: 132).

Dissiliaria sp. (Rocky River B. Hyland 10882) (Forster 1994).

Illustration: Christophel & Hyland (1993: 102F).

Tree up to 13 m high. Trunk not buttressed, often suckering strongly from base. Bark brownish, with numerous dark brown pustulate lenticels; blaze pink. Branchlets ± rounded, with sparse trichomes when young, glabrescent, with dense lenticels even when young. Stipules lanceolate, 2–2.5 mm long, c. 0.7 mm wide, with sparse trichomes. Leaves with sparse trichomes when young, glabrescent, pale green; petioles 1.5–3 mm long, 0.5–0.8 mm diameter; laminas narrowly elliptic, 22–65 mm long, 7–27 mm wide, chartaceous, venation composed of 7 or 8 prominent lateral veins per side of midrib and interlateral reticulate tertiary veins; margins crenate with 17 to 23 teeth per side of midrib; upper surface glossy green, venation ± obscure; lower surface pale green, venation prominent; tip short to long acuminate; base cuneate. Male inflorescences 1–3 in distal axils with peduncles up to 2 mm long, with sparse trichomes; bracts lanceolate, 1–1.8 mm long, 0.3–0.4 mm wide, glabrous. Male flowers with pedicels 5–10 mm long, c. 0.3 mm diameter, with scattered trichomes at base; sepals obovate, 1.8–2.3 mm long, 0.8–1.2 mm wide, glabrous or with scattered trichomes and

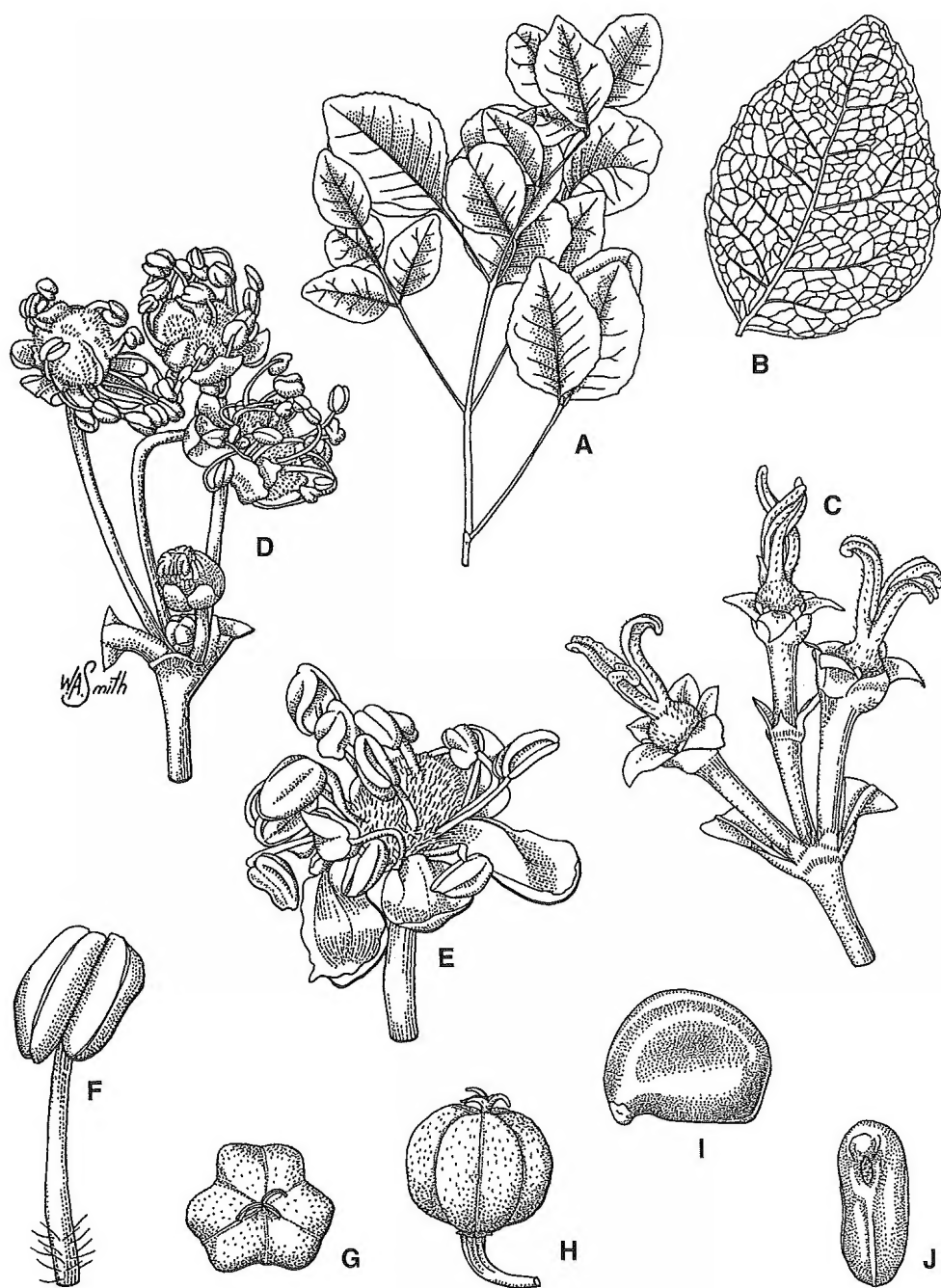
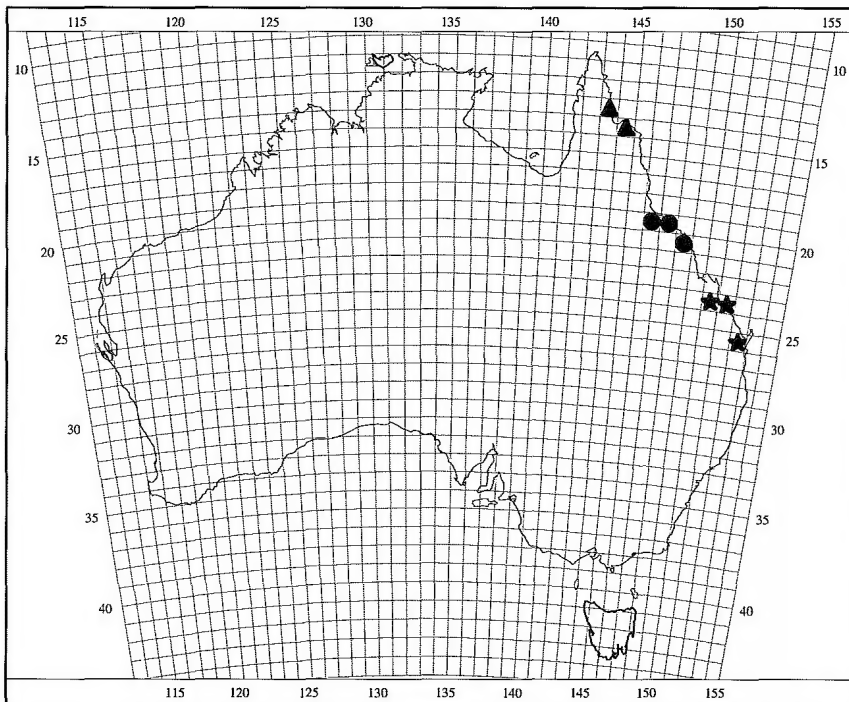


Fig. 5. *Dissiliaria muelleri*. A. twig $\times 1$. B. detail of adaxial leaf surface $\times 2$. C. female inflorescence $\times 8$. D. male inflorescence $\times 8$. E. male flower $\times 16$. F. stamen $\times 32$. G. apical view of fruit $\times 4$. H. lateral view of fruit $\times 4$. I. lateral view of seed $\times 8$. J. ventral view of seed $\times 8$. A,B from *Forster 12519A & Smyrell* (BRI); C from *Forster 12713* (BRI); D-F from *Forster 12519B & Smyrell* (BRI); G,H from *Forster 3372 & Gibson* (BRI); I,J from *Forster 14629* (BRI). Del. W. Smith.

marginal cilia; disk c. 1.6 mm diameter, with dense trichomes; stamens 16; filaments filiform, 1–1.4 mm long; anthers 0.8–1 mm long, 0.3–0.5 mm wide. Female inflorescences and flowers not seen. Fruit subglobose, strongly trilobate, 9–10 mm long, 11–12 mm diameter, $\pm$ glabrous. Seed not seen. Fig. 6.

Selected additional specimens examined: Queensland. COOK DISTRICT: Temple Creek Catchment, Cape Melville N.P., 15 km NW of Barrow Point, 14°17'S, 144°31'E, Jul 1993, *Fell* 3331 et al. (BRI, CANB, DNA, MBA, MEL, QRS); Rocky River Scrub, Silver Plains Station, 13°48'S, 143°28'E, Jun 1992, *Forster* 10606 et al. (BRI, QRS); ditto, Jul 1993, *Forster* 13620 et al. (BRI, QRS); Upper Massey Creek, c. 15 miles [25 km] ENE of Coen, Oct 1962, *Smith* 11730 (BRI); McIlwraith Range, c. 11 miles [18.3 km] ENE of Coen, Oct 1962, *Smith* 11792 (BRI); Rocky River, eastern foothills of McIlwraith Range, 13°47'S, 143°25'E, Oct 1969, *Webb & Tracey* 9435 (BRI).

Distribution and habitat: *D. surculosa* is endemic in Cape York Peninsula where it is known from the eastern fall of the McIlwraith Range and Cape Melville (Map 2). At the McIlwraith Range, plants grow near watercourses in semideciduous notophyll to mesophyll vineforest on deep alluvia derived from metamorphic and granite substrates. This gallery-forest is usually flooded during the wet season and in July 1993, there was evidence of flood debris some 12 m above the ground in the crowns of the trees. Associated plants include *Castanospermum australe* A.Cunn. & Fraser ex Hook., *Ficus albipila* (Miq.) King, *Haplostichanthus* sp. (Rocky River Scrub P.I. Forster PIF10617), *Rhodamnia australis* A.J.Scott, *Pilidiostigma recurvum* (C.T.White) A.J.Scott, and *Codiaeum variegatum* var. *moluccanum* (Decne.) Muell.Arg. At Cape Melville, the plants grow in semi-deciduous



Map 2. Distribution of ● *Dissiliaria indistincta*, ▲ *D. surculosa* and ★ *D. muelleri*



Fig. 6. *Dissiliaria surculosa*. A. twig $\times 1$. B. node with male inflorescence $\times 2.5$. C. male flower $\times 5$. D. stamen $\times 10$. E. apical view of fruit $\times 2$. F. lateral view of fruit $\times 2$. G. ventral view of seed $\times 5$. H. lateral view of seed $\times 5$. I. seedling $\times 1$. A–D from Hyland 10882 (BRI); E–I from Forster 13620 (BRI). Del. W. Smith.

notophyll to microphyll vine thicket on hillslopes on colluvium derived from granite. Associated canopy species at this locality include *Pongamia pinnata* (L.) Pierre and *Wodyetia bifurcata* Irvine.

Notes: *D. surculosa* appears to have been first collected by L.S. Smith in 1962. Sterile material of this plant was referred with doubt to *D. muelleri* by Airy Shaw (1981). *D. surculosa* strongly resembles *D. muelleri*, but differs in its narrowly elliptic leaf laminae with a short to long acuminate tip, the 17–23 marginal teeth per side of the midrib, the dense lenticels on young stems and the sepals of the male flowers being obovate and 0.8–1.2 mm wide.

Conservation status: *D. surculosa* is apparently restricted in its distribution. At present there appear to be no obvious threats to this plant and it is present in Cape Melville National Park. No conservation coding is thought necessary.

Etymology: The specific epithet is derived from the Latin *surculus* (shoot, sucker) and *-osa* (abundant) which alludes to the tendency of this plant to profusely sucker from the stems. This suckering could be due to damage from irregular flooding in the habitat.

Excluded species

1. *Dissiliaria tricornis* Benth., Fl. Austral. 6: 91 (1873).

This is *Choriceras tricornis* (Benth.) Airy Shaw.

2. *Dissiliaria* sp. RFL#25730 (Christophel & Hyland 1993: 102g; Hyland & Whiffin 1993, 2: 132).

Dissiliaria sp. (Rex Range, G. Sankowsky 1075) (Forster 1994).

This was described as *Sankowskya stipularis* P.I. Forst. (Forster 1995).

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References

- AIRY SHAW, H.K. (1980). New or noteworthy Australian Euphorbiaceae - II. *Muelleria* 4: 207–241.
- (1981). A partial synopsis of the Euphorbiaceae - Platyloboae of Australia (excluding *Phyllanthus*, *Euphorbia* and *Calycopeplus*). *Kew Bulletin* 35: 577–700.
- BAILLON, H.E. (1867). Species Euphorbiacearum. Recherches complémentaires sur les Euphorbiacées Australiennes. *Adansonia* 7: 352–360.
- BARLOW, B.A. & HYLAND, B.P.M. (1988). The origins of the flora of Australia's wet tropics. *Proceedings of the Ecological Society of Australia* 15: 1–17.
- BENTHAM, G. (1873). Euphorbiaceae. In *Flora Australiensis* 6: 41–153. London: L. Reeve & Co.
- CHAPMAN, A.D. (1991). *Australian Plant Name Index*. Canberra: Australian Government Publishing Service.
- CHRISTOPHEL, D.C. & HYLAND, B.P.M. (1993). *Leaf Atlas of Australian Tropical Rain Forest Trees*. Melbourne: CSIRO Publications.
- COOPER, W. & COOPER, W.T. (1994). *Fruits of the Rainforest*. Chatswood (Sydney): RD Press.

- FORSTER, P.I. (1994). Euphorbiaceae (in part). In R.J.F.Henderson (ed.), *Queensland Vascular Plants: Names and Distribution*. Brisbane: Queensland Department of Environment & Heritage.
- (1995). *Sankowskya*, a new genus of Euphorbiaceae (Dissiliariinae) from the Australian Wet Tropics. *Austrobaileya* 4: 329–335.
- FORSTER, P.I., BOSTOCK, P.D., BIRD L.H. & BEAN, A.R. (1991). *Vineforest Plant Atlas for South-east Queensland*. Brisbane: Queensland Herbarium.
- FRANCIS, W.D. (1981). *Australian Rain-forest Trees*. 4th Ed. Canberra: Australian Government Publishing Service.
- HAUSER, J. (1992). *Fragments of Green*. Bardon (Brisbane): Rainforest Conservation Society Inc.
- HAYDEN, W.J. (1994). Systematic anatomy of Euphorbiaceae subfamily Oldfieldioideae. I. Overview. *Annals of the Missouri Botanical Garden* 81: 180–202.
- HEWSON, H. (1988). *Plant Indumentum. A Handbook of Terminology*. Australian Flora and Fauna Series No. 9. Canberra: Australian Government Publishing Service.
- HYLAND, B.P.M. & WHIFFIN, T. (1993). *Australian Tropical Rain Forest Trees: An Interactive Identification System*. Melbourne: CSIRO Publications.
- LEVIN, G.A. & SIMPSON, M.G. (1994). Phylogenetic implications of pollen ultrastructure in the Oldfieldioideae (Euphorbiaceae). *Annals of the Missouri Botanical Garden* 81: 203–238.
- RAO, P.N. & RAJU, V.S. (1985). Foliar trichomes in the family Euphorbiaceae. In C.M. Govil & V. Kumar (eds.), *Trends in Plant Research*, pp. 128–136. Dehra Dun: Bishen Singh & Mahendra Pal Singh (n.v., cited by Hayden 1994).
- WEBB, L.J. (1978). A general classification of Australian rainforests. *Australian Plants* 9: 349–363.
- WEBB, L.J. & TRACEY, J.G. (1981). Australian rainforests: pattern and change. In A. Keast (ed.), *Ecological Biogeography of Australia*. pp. 605–694. The Hague: W. Junk.
- WEBSTER, G.L. (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

Three new species of *Fontainea* Heckel (Euphorbiaceae) from Australia and Papua New Guinea

Paul I. Forster

Summary

Forster, Paul I. (1997). Three new species of *Fontainea* Heckel (Euphorbiaceae) from Australia and Papua New Guinea. *Austrobaileya* 5(1): 29–37. *Fontainea fugax* P.I.Forst. from Queensland, Australia, and *F. borealis* P.I.Forst. and *F. subpapuana* P.I.Forst. from Papua New Guinea are named as new species. Information is provided on their distribution, habitat and affinities. Separate identification keys are provided for *Fontainea* in New Guinea and Australia.

Keywords: Euphorbiaceae, *Fontainea*, *Fontainea borealis*, *Fontainea fugax*, *Fontainea subpapuana*, Papua New Guinea, Queensland.

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Introduction

The genus *Fontainea* Heckel is classified in Euphorbiaceae, subfamily Crotonoideae, tribe Codiaeae (Webster 1994) and comprises shrubs or small trees that grow in rainforest communities. Jessup & Guymer (1985) revised *Fontainea* and recognised six species for Australia and New Caledonia, as well as mentioning additional unnamed taxa from Papua New Guinea and New Caledonia.

Airy Shaw (1974, 1980) referred the collections of *Fontainea* from Papua New Guinea to *F. pancheri* (Baillon) Heckel based on their similarity to the type of this species from New Caledonia. Jessup & Guymer (1985) thought this identification unlikely, but did not resolve the identity of the species in Papua New Guinea due to the incomplete nature of the available specimens.

In preparing accounts of *Fontainea*, both for 'Flora of Australia' and 'Flora Malesiana', it is now necessary to determine the status of the *Fontainea* collections from Papua New Guinea. Although no further collections have been made in the decade since Jessup & Guymer's account, the available collections do enable diagnostic characters to be determined, as well as preparation of descriptions and discussion of affinities. There are two species

of *Fontainea* present in Papua New Guinea, one from the north-east and one from the south-east parts of the country. These are named as *F. borealis* and *F. subpapuana* respectively. An additional species of *Fontainea* from south-east Queensland, Australia has also been discovered in the last decade, and is named *F. fugax*.

Taxonomy

1. *Fontainea borealis* P.I.Forst., sp. nov. affinis *F. picrospermae* C.T.White a qua lamina folii prope basem eglandulosa, calyce 4-lobato lobatis ovatis, petalis obovatis usque lanceolatiovatis, floribus maribus disco c. 0.6 mm alto lobato irregulariter, et staminibus connatis 1–1.5 mm super discum differt. **Typus:** Papua New Guinea. EASTERN HIGHLANDS PROVINCE: Aiyura, Oct 1944, L.S. Smith NGF1030 (holo: K; iso: BRI; L n.v.).

Shrub or small tree to 12 m high; stem exudate colour unknown. New shoots with dense, antrorse golden trichomes. Stipules absent. Leaves petiolate, discolorous; petioles 10–26 mm long, 1–1.4 mm diameter, swollen at base and apex, narrowly channelled above, glabrous; lamina elliptic to oblanceolate, 56–240 mm long, 22–70 mm wide, not decurrent, chartaceous; upper surface dark green; lower surface pale green; venation comprising 8–14 lateral veins per side of midrib and reticulate interlateral veins; tip acute to

acuminate; base cuneate; glands absent from base of lamina. Male inflorescences terminal or axillary, with sparse trichomes. Male flowers 5–7 mm long, 7–8 mm diameter; pedicels 2.5–5 mm long, c. 1 mm wide, with scattered trichomes; calyx 4-lobed, 2.8–3.5 mm long, lobes ovate; petals 5, lanceolate-ovate to obovate, 5–6 mm long, 2–3.5 mm wide, weakly recurved, externally and internally with dense velutinous trichomes; disk undulate with grooves, c. 0.6 mm long and 2.5 mm diameter, glabrous; stamens 24–28, connate 1–1.5 mm above top of disk, filaments free for 2–2.5 mm,

glabrous towards top, densely hairy at base; anthers c. 0.8 mm long and 0.5 mm wide. Female flowers not seen. Fruit not seen. Fig. 1.

Additional specimens examined: Papua New Guinea. EASTERN HIGHLANDS PROVINCE: Numura, an Strasse Kainantu - Goroka, 0.5 mile nach Abzweigung nach Okapa, 6 mile von Kainantu, Jan 1964, Stauffer 5608 & Sayers (K; L n.v.).

Distribution and habitat: *Fontainea borealis* is known only from the Eastern Highlands Province of Papua New Guinea. Plants have been recorded from rainforest at altitudes of 1800–2000 m.

Notes: The available herbarium material of *F. borealis* is incomplete thus preventing a detailed description. *F. borealis* appears to be allied to the Australian *F. picrosperma* C.T.White and a comparison of these two taxa is made in Table 1.

Table 1. Morphological comparison of *Fontainea picrosperma* and *F. borealis*.

Character	<i>F. picrosperma</i>	<i>F. borealis</i>
glands in leaf lamina	present	absent
disk	undulate to lobed 0.7–1 mm high	irregularly lobed c. 0.6 mm high
male calyx	2–3-lobed	4-lobed
male calyx lobes	triangular-ovate to	ovate broadly ovate
male petals	oblong-ovate	obovate to lanceolate-ovate
stamens connate	c. 0.5 mm	1–1.5 mm

HERB. HORT. KEW.

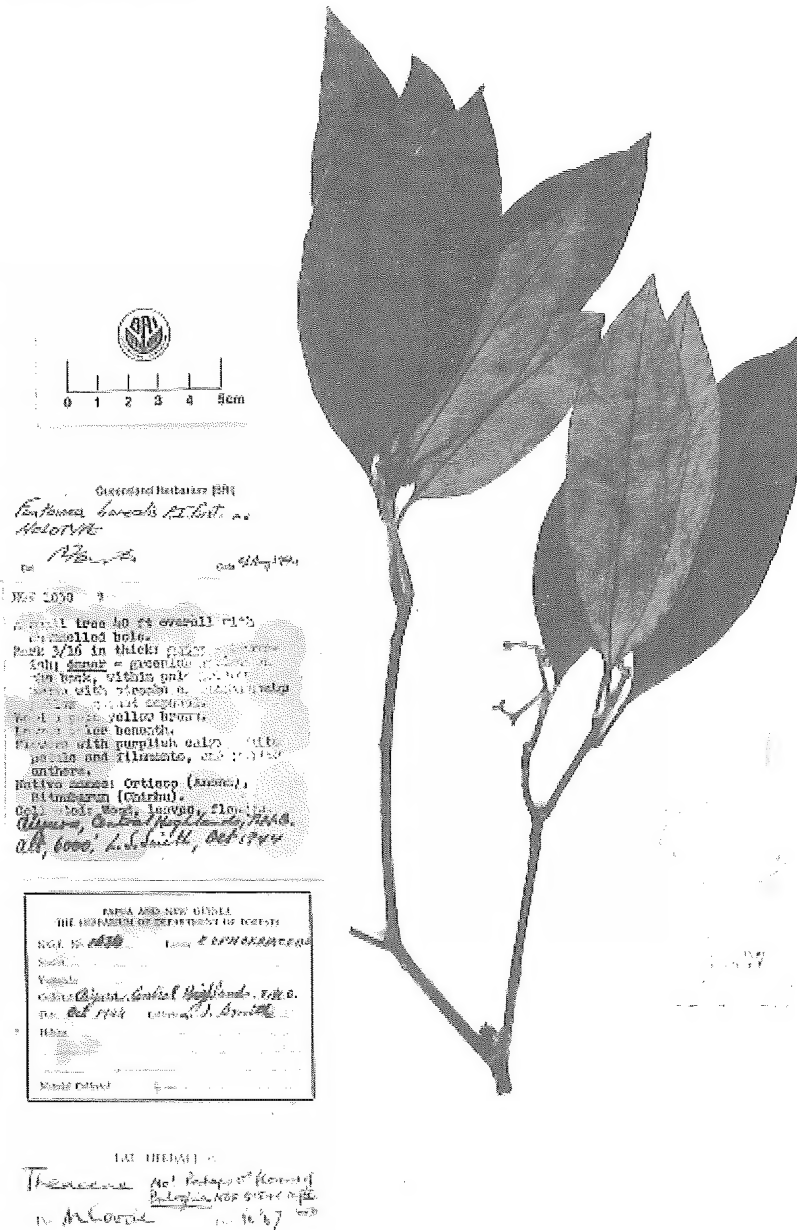


Fig. 1. *Fontainea borealis* P.I. Forst. Photograph of holotype at K.

Conservation status: Unknown.

Etymology: The specific epithet is derived from Latin *borealis* (northern) and refers to the northerly distribution of this species within the genus.

2. *Fontainea subpapuana* P.I.Forst., sp. nov.

affinis *F. picrospermae* C.T.White a qua petiolo tumido ad apicem tantum, lamina folii venis primariis utroque costate 13–15, calyce florum marium 4–5-lobato, stylis longioribus (3–3.5 mm longis), et endocarpo paginis intersuturalibus latioribus (12–13 mm latis) differt. **Typus:** Papua New Guinea. CENTRAL PROVINCE: Kuriva Forestry area, near Weimauri River, 9°05'S, 147°05'E, 6 May 1971, *H.Streimann & A.Kairo* LAE51548 (holo: K; iso: BRI, K; L n.v.).

Tree to 7 m high; stems with red exudate. New shoots with dense, antrorse yellow trichomes. Stipules absent. Leaves petiolate, discolorous; petioles 12–20 mm long, 1–1.4 mm diameter, swollen at top and narrowly channelled above, with scattered trichomes; lamina elliptic to oblanceolate, rarely obovate, 60–170 mm long, 30–60 mm wide, not decurrent, chartaceous; upper surface dark green; lower surface pale green; venation comprising 13–15 lateral veins and reticulate

interlateral veins; tip acuminate; base cuneate to weakly attenuate; glands elliptic, sessile, 1–2 mm long, $\pm$ marginal, 0.5–1 mm from base of lamina. Male inflorescences not seen. Male flowers not seen. Female inflorescence terminal, comprising 1–3 flowers. Female flowers 5–8 mm long, 10–13 mm diameter; pedicels 7–15 mm long, 1–1.2 mm diameter, with sparse trichomes; calyx 4–5-lobed, 2–2.5 mm long, lobes rounded-ovate, with sparse trichomes; petals 5, lanceolate-ovate, 6–8 mm long, 2.5–3 mm wide, $\pm$ recurved, with dense velutinous trichomes externally and internally; disk not dissected; ovary 3–4-locular, ovoid, with dense antrorse trichomes; styles 3–3.5 mm long. Intact fruit not seen. Sarcocarp red (n.v.). Endocarp very shortly beaked, 3-ridged at sutures; intersutural faces smooth, convex, 25–26 mm long, 12–13 mm wide. Fig. 2.

Distribution and habitat: *Fontainea subpapuana* is known only from Central Province in south-east Papua New Guinea. Plants were recorded as growing in lowland rainforest on river flats.

Notes: *Fontainea subpapuana* is very poorly known and the above description lacks significant details with regard to the male flowers and mature fruit. This species is closely allied to the Australian *F. picrosperma*. *Fontainea subpapuana* and *F. picrosperma* are compared in Table 2. *Fontainea subpapuana* and *F. borealis* may be distinguished with the following key.

1. Leaf petioles swollen at base and apex; glands absent from lamina ***F. borealis***
- Leaf petioles swollen only at apex; glands present in lamina and $\pm$ marginal near base ***F. subpapuana***

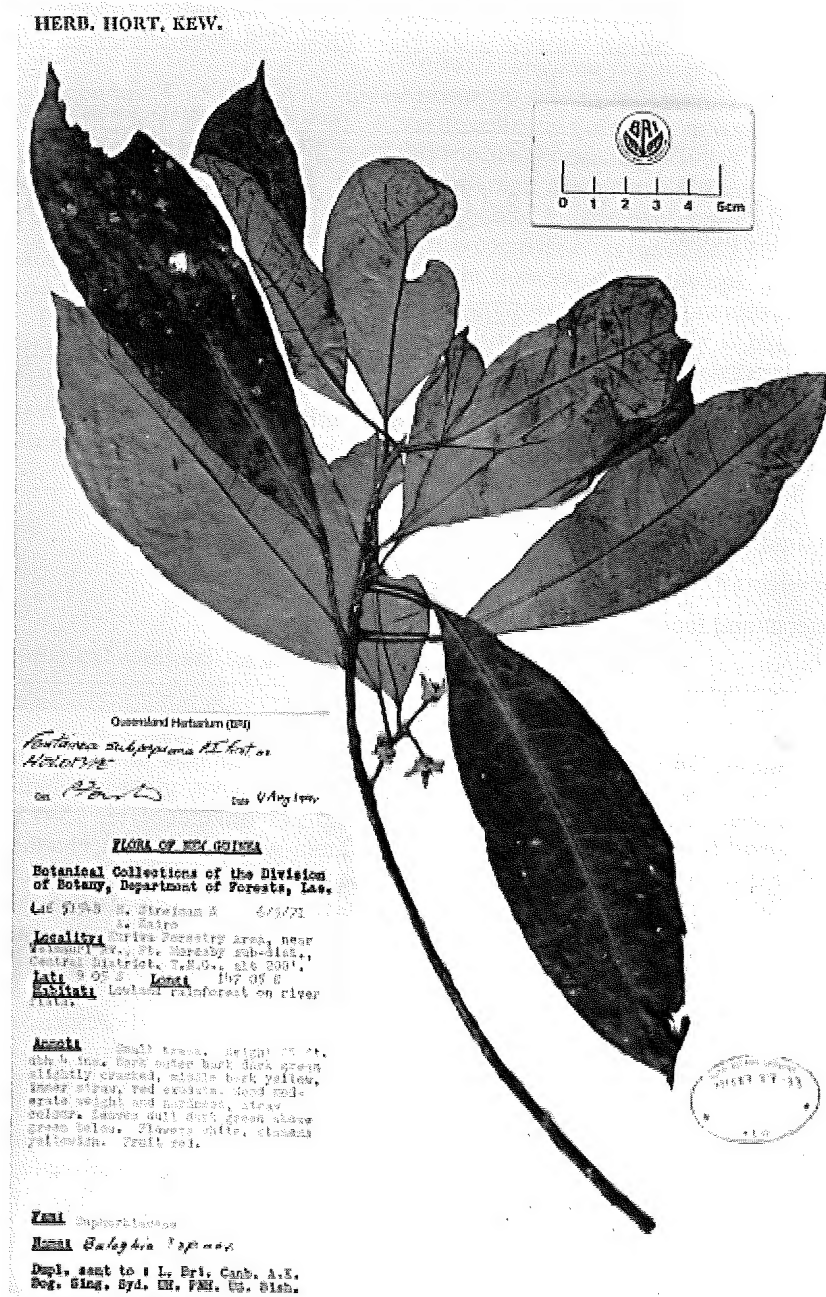


Fig. 2. *Fontainea subpapuana* P.I. Forst. Photograph of holotype at K.

Table 2. Morphological comparison of *Fontainea picrosperma* and *F. subpapuana*.

Character	<i>F. picrosperma</i>	<i>F. subpapuana</i>
No. lateral veins per side of leaf lamina midrib	8–12	13–15
Petiole base	swollen	not swollen
Petiole apex	swollen	swollen
male flower calyx	2–3-lobed	4–5-lobed
style length (mm)	0.8–2	3–3.5
endocarp intersutural face width (mm)	7–10	12–13

Conservation status: Unknown.

Etymology: The specific epithet is derived from Latin *sub-* (below) and *papuana* (of Papua), and refers to the distribution of this species on the south coast of Papua New Guinea.

3. *Fontainea fugax* P.I.Forst., sp. nov. affinis *F. rostratae* Jessup & Guymer a qua petiolo ad basem etumido, floribus maribus minoribus (4–5 × 6–8 mm) et staminibus paucioribus (24), endocarpo rostro brevior (1–1.7 mm longo) et paginis intersuturalibus leniter rugosis plus minusve planis usque leniter convexis et perminore (15–17 × 8–9.5 mm) differt. **Typus:** Queensland. BURNETT DISTRICT: Fontainea Scrub, State Forest 172, Gurgeena Plateau, 9 Feb 1994, *P.I. Forster* 14802 (holo: BRI [1 sheet + spirit, male plant])

Shrub to 4 m high; stems with clear exudate. New shoots with sparse, antrorse uncoloured trichomes. Stipules absent. Leaves petiolate, discolorous; petioles 2–4 mm long, c. 1 mm

diameter, of uniform thickness and narrowly channelled above, glabrous; lamina elliptic, obovate or oblanceolate, 15–75 mm long, 6–42 mm wide, ± decurrent, chartaceous; upper surface dark green; lower surface pale green; venation comprising 6–10 lateral veins and reticulate interlateral veins; tip acute to obtuse; base cuneate; glands elliptic, sessile, 1–2 mm long, markedly intramarginal, 2–8 mm from base of lamina. Male inflorescence terminal or axillary, with sparse trichomes. Male flowers 4–5 mm long, 6–8 mm diameter; pedicels 2.5–5 mm long, 0.5–1 mm wide, with sparse trichomes; calyx 4-lobed, 2–2.5 mm long, lobes ovate; petals 4, lanceolate-ovate, 4.5–5 mm long, 2–2.5 mm wide, strongly recurved, externally with sparse trichomes, internally with sparse trichomes apart from near base where they are dense and velutinous; disk irregularly crenate, 0.4–0.8 mm long, 2–3 mm diameter, glabrous; stamens 24, connate up to 1.5 mm above top of disk, filaments free for 1–3 mm, glabrous towards top, densely hairy at base; anthers 0.6–0.8 mm long, 0.4–0.5 mm wide. Female flowers not seen. Intact fruit not seen. Sarcocarp with sparse trichomes. Endocarp

beaked for 1–1.7 mm at tip, 3–4-ridged at sutures; intersutural faces weakly rugose, ± flat to slightly convex, 15–17 mm long, 8–9.5 mm wide. Fig. 3.

Additional specimens examined: Queensland. BURNETT DISTRICT: Portion 90, S.F. 172 [now a Conservation Park], Aug 1988, *Forster* 4687 (BRI); Fontainea Scrub, S.F. 172, Oct 1993, *Forster* 14130 (BRI); ditto, May 1996, *Forster* 19158 (BRI).

Distribution and habitat: *Fontainea fugax* is known only from the Binjour–Gurgeena Plateau area between Gayndah and Mundubbera in the Burnett district of south-east Queensland. Plants grow as understorey shrubs in semi-evergreen vine thicket with a canopy dominated by *Backhousia kingii*

Guymer on red eucrozem soils at altitudes between 350 and 400 m.

Notes: *Fontainea fugax* is closely allied to *F. rostrata* Jessup & Guymer and the initial sterile collection of the plant was referred to as this species (Forster et al. 1991). A comparison of important diagnostic differences between *F. fugax* and *F. rostrata* is provided in Table 3. This comparison is based on limited material of male flowers and endocarps, yet provides clear morphological discontinuities between the two entities. Unfortunately it has not been possible to obtain herbarium material of female flowers and mature fruits, this is despite repeated visits (c. 10) between 1994 and mid 1996 after rainfall events when flowering could be expected. This situation could persist indefinitely and due to the rarity of this plant it is considered more beneficial for its conservation if the species is formally named.

Table 3. Morphological comparison of *Fontainea fugax* and *F. rostrata*.

Character	<i>F. fugax</i>	<i>F. rostrata</i>
petiole	base not swollen	base slightly swollen
male flowers	4–5 × 6–8 mm	4–6 × 11–13 mm
stamen no.	24	28–40
endocarp beak	1–1.7 mm long	2–3 mm long
intersutural faces	weakly rugose ± flat to concave 15–17 × 8–9.5 mm	strongly rugose ± flat to weakly convex 20–23 × 11–13 mm

Conservation status: *Fontainea fugax* is known from only two populations in close proximity to one another. One population (apparently of one plant) is present in a Conservation Park (site 50 of Forster et al. 1991). The other population (with less than 50 plants) is present in State Forest within a very small stand of vine thicket that is experiencing repeated fire incursions on its western boundary and weed infestations of

Mexican daisy – *Verbesina encelioides* (Cav.) Benth. & Hook.f. ex A.Gray and Dutchmans Pipe–*Aristolochia elegans* Mast., on the eastern boundary associated with fence construction by the leaseholder. Virtually all semi-evergreen vine thicket on the Binjour–Gurgeena Plateau that is not in conservation Park or State Forest, has now been cleared for agriculture and grazing. This area is notable for other endangered or geographically significant plant

species that occur in the semi-evergreen vine thicket communities, especially *Pomaderris clivicola* E.M.Ross, *Bertya opposens* (F.Muell. ex Benth.) Guymer, *B. pedicellata* F.Muell. and *Zieria* sp. (Binjour Plateau P.I.Forster

14134). Both *F. fugax* and the community in which it occurs, are endangered in the central Burnett district. A conservation coding of E (endangered) is recommended for listing under the *Queensland Nature Conservation Act* 1992.

Etymology: The specific epithet is derived from Latin *fugax* (fleeting, transitory) and alludes to the difficulty of obtaining material of the flowers of this species.

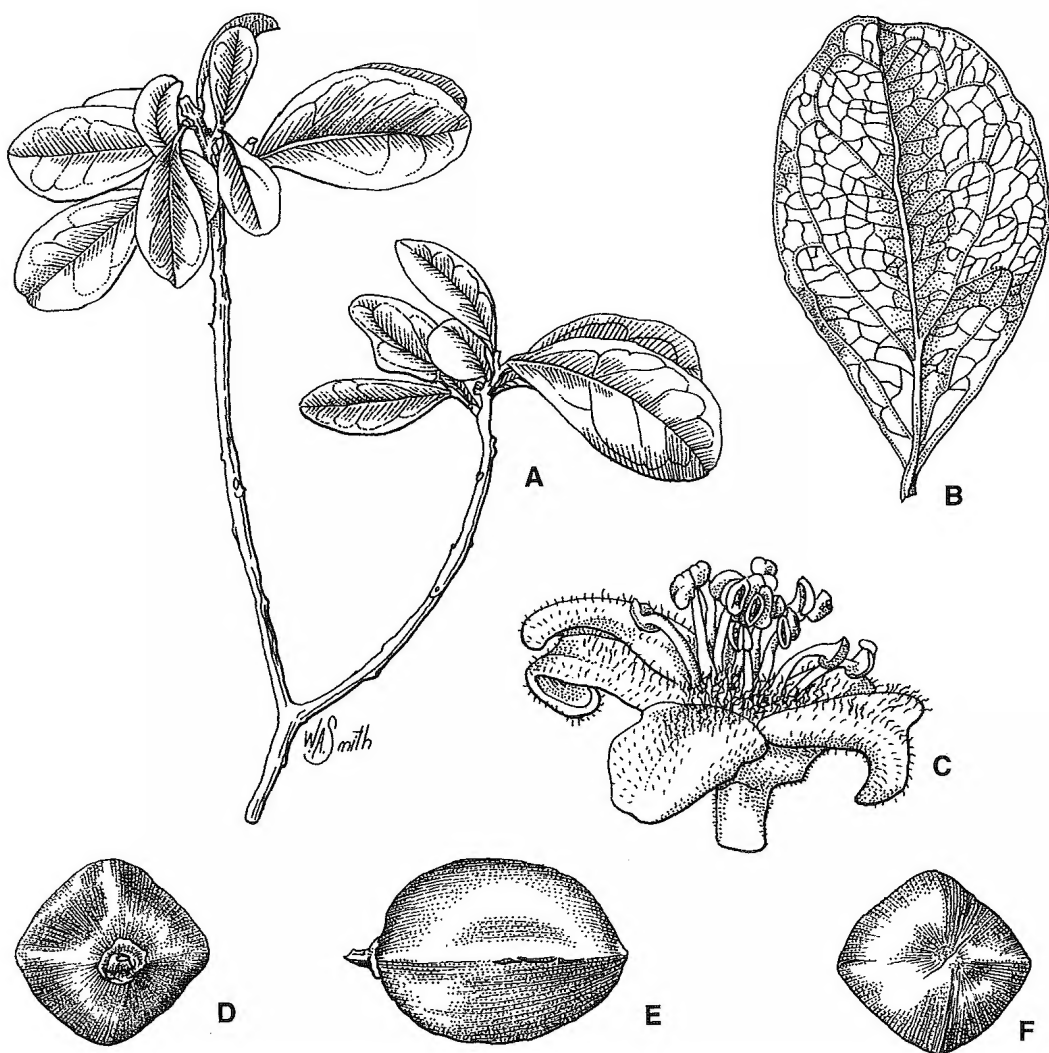


Fig. 3. *Fontainea fugax* P.I.Forster. A. twig $\times 0.8$. B. undersurface of leaf showing venation $\times 1.5$. C. male flower $\times 6$. D–F. views of endocarps $\times 2$. A–C Forster 14802 (BRI), D–F Forster 14130 (BRI). Del. W.Smith.

Key to the Australian taxa of *Fontainea*

1. Leaf petioles slightly swollen at base and apex; male flower disk with dense trichomes 2
 Leaf petioles of uniform thickness or slightly swollen only at base; male flower disk glabrous 4
2. Leaf petioles not geniculate; basilaminar glands marginal; fruit endocarp beaked **F. picrosperma**
 Leaf petioles $\pm$ geniculate; basilaminar glands intramarginal to submarginal; fruit endocarp not beaked 3
3. Fruit broadly ovoid, 27–27 mm long; endocarp intersutural faces smooth **F. australis**
 Fruit globose to depressed-globose, 18–22 mm long; endocarp intersutural faces rugose **F. oraria**
4. Leaf basilaminar glands marginal, at junction of petiole and lamina; endocarp not beaked, intersutural faces smooth with scattered vascular foramina **F. venosa**
 Leaf basilaminar glands intramarginal to submarginal, 2–22 mm from lamina base; endocarp beaked for 1–3 mm, intersutural faces rugose 5
5. Leaf petioles of uniform thickness; fruit endocarp beaked for 1–1.7 mm; endocarp intersutural faces weakly rugose, 15–17 mm long, 8–9.5 mm wide **F. fugax**
 Leaf petioles slightly swollen at base; fruit endocarp beaked for 2–3 mm; endocarp intersutural faces strongly rugose, 20–23 mm long, 11–13 mm wide **F. rostrata**

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References

- AIRY SHAW, H.K. (1974). The genus *Fontainea* in New Guinea. *Kew Bulletin* 29: 326–328.
- AIRY SHAW, H.K. (1980). The *Euphorbiaceae* of New Guinea. *Kew Bulletin Additional Series* VIII. London: Royal Botanic Gardens, Kew.
- FORSTER, P.I., BOSTOCK, P.D., BIRD, L.H. & BEAN, A.R. (1991). *Vineforest Plant Atlas for South-east Queensland*. Brisbane: Queensland Herbarium.
- JESSUP, L.W. & GUYMER, G.P. (1985). A revision of *Fontainea* Heckel (Euphorbiaceae: Cluytiaceae). *Austrobaileya* 2: 112–125.
- WEBSTER, G.L. (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

A revision of *Rubus* subg. *Malachobatus* (Focke) Focke and *Rubus* subg. *Diemenicus* A.R.Bean (Rosaceae) in Australia

A.R. Bean

Summary

Bean, A.R. (1997). A revision of *Rubus* subg. *Malachobatus* (Focke) Focke and *Rubus* subg. *Diemenicus* A.R.Bean (Rosaceae) in Australia. *Austrobaileya* 5(1): 39–51. The five indigenous and naturalised Australian taxa belonging to *Rubus* subg. *Malachobatus* (Focke) Focke and *Rubus* subg. *Diemenicus* subg. nov. are treated. A new variety, *R. moluccanus* var. *trilobus* A.R.Bean is described. A key to the native and naturalised Australian taxa of *Rubus* is presented.

Keywords: taxonomy, Rosaceae, *Rubus*, Australian flora, key, *Rubus* subg. *Malachobatus*, *Rubus* subg. *Dalibarda*, *Rubus* subg. *Diemenicus*, *Rubus alceifolius*, *Rubus moluccanus* var. *moluccanus*, *Rubus moluccanus* var. *trilobus*, *Rubus hillii*, *Rubus* x *novus*, *Rubus gunnianus*.

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Introduction

Rubus L. is a large genus with many representatives in the northern hemisphere, but it is poorly represented in the southern hemisphere. For example, five indigenous species are recorded for New Zealand (Webb et al. 1980). Australia is similarly poorly endowed, with a total of eight indigenous species, one hybrid and some infraspecific taxa (Bean 1995, 1997).

Two subgenera are treated in this paper:

Rubus* subg. *Malachobatus (Focke) Focke is a large subgenus with an estimated 127 species (Thompson 1997), and with its centre of diversity in eastern Asia. Twenty species have been recorded for Malesia (Kalkman 1984). New Guinea has three indigenous species, and Australia has just one (*R. moluccanus* L.). A second species, *R. alceifolius* Poir. is naturalised in north Queensland. *Rubus rugosus* Sm., while not known to be naturalised in Australia, is occasionally cultivated, and has been misidentified by Australian botanists as either *R. moluccanus* (Symon 1986) or *R. hillii* (Bennett 1987).

Rubus gunnianus was formerly included by Focke (1910) with four other species (*R. lasiococcus* Gray, *R. pedatus* Sm., *R. fockeanus* Kurz and *R. dalibarda* L.) in *Rubus* subg. *Dalibarda* (L.) Focke. The first three of these species were transferred to *R. subg. Cylactis* (Focke) Focke by Bailey (1941), and all botanists since Focke have accorded *R. dalibarda* generic status, as *Dalibarda repens* L. (e.g. Bailey 1941, Gleason 1952, Scoggan 1978). *R. gunnianus* has a number of unique characteristics (see discussion later) and a new subgenus, *Rubus* subg. *Diemenicus* A.R.Bean is erected here for it.

This is the third and final paper revising the Australian species of *Rubus*. It is not intended to deal with the taxonomy of naturalised taxa of *Rubus* L. subg. *Rubus*, and in the following key, the European Blackberry complex (*R. fruticosus* agg.) is not subdivided. A key to these species may be found in Harden & Rodd (1990).

Taxonomy**Key to native and naturalised taxa of *Rubus* in Australia. Naturalised taxa are marked with an asterisk (*)**

1. Plants herbaceous, without prickles, carpels 6–10 **R. gunnianus**
Plants woody, with prickles, carpels 25–600 2
2. Vines, without differentiated stems or canes; inflorescence axillary,
 race-mose; flowers unisexual 3
 Sprawling shrubs, with stout sterile canes (primocanes) and
 flower-bearing side-shoots (floricanes); inflorescence terminal,
 paniculate; flowers bisexual 4
3. Undersides of leaflets densely hairy throughout; margins with 5–7
 teeth/cm; stipules present; carpels not glandular; aggregate fruits with
 16–30 hairy carpids **R. moorei**
 Undersides of leaflets glabrous except for domatia and hairs along veins;
 margins with 3–5 teeth/cm; stipules absent; carpels glandular; aggregate
 fruits with 35–65 glabrous carpids **R. nebulosus**
4. Leaves on primocanes (and floricanes) simple 5
 Leaves on primocanes compound 7
5. Stipules up to 15 × 15 mm, divided almost to their base, filamentous; leaves
 (especially young leaves) with a mixture of short and long hairs on
 adaxial surface ***R. alceifolius**
 Stipules up to 12 × 6 mm, undivided at base, not filamentous; leaves
 with only long hairs on adaxial surface, or glabrous 6
6. Most or all leaves prominently 3-lobed, with end lobe about
 two-thirds the length of the leaf; indumentum on petioles rather sparse,
 mostly appressed; petals mostly pink **R. moluccanus** var. **trilobus**
 Leaves unlobed or lobes <1 cm deep, never prominently 3-lobed;
 indumentum on petioles dense, mostly spreading; petals white
 **R. moluccanus** var. **moluccanus**
7. Leaves on primocanes pinnate or trifoliolate 8
 Leaves on primocanes pedate or palmate 14
8. Leaflets 3–5, white or yellowish underneath, due to dense cover of short
 hairs obscuring the leaflet surface 9
 Leaflets 5–9, green underneath, glabrous or hairy, surface of leaflets not
 obscured by hairs 11
9. Branchlets with erect reddish hairs or bristles; petals white; fruits yellow ... ***R. ellipticus**
 Branchlets with appressed white hairs; petals pink or red; fruits (when
 formed) red 10
10. Stipules 2-lobed, occasionally 3 or 4-lobed, fruits never formed **R. x novus**
 Stipules entire, fruits formed **R. parvifolius**

11. Branchlets glabrous; leaflets glabrous or sparsely hairy on veins 12
Branchlets hairy; leaflets hairy throughout 13
12. Most carpels glandular; leaflets 14–27 mm wide; petals hairy on
both surfaces **R. queenslandicus**
No carpels glandular; leaflets 20–48 mm wide; petals glabrous on inner
surface **R. probus**
13. Flowers with 5 petals **R. rosifolius** var. **rosifolius**
Flowers with 9–13 petals **R. rosifolius** var. **commersonii**
14. Leaflets deeply incised or pinnatisect ***R. laciniatus**
Leaflets often lobed, but never deeply incised or pinnatisect. 15
15. Floricanes pruinose; mature fruits red ***R. ursinus**
Floricanes not pruinose; mature fruits black 16
16. Lower surface of leaflets green and stems without glandular hairs; petals
11–16 mm long ***R. bellobatus**
Lower surface of leaflets glaucous or stems with glandular hairs; petals
6–11 mm long ***R. fruticosus** agg.

Rubus subg. **Malachobatus** (Focke) Focke,
Biblioth. Bot. 72: 41 (1910); *R.* sect.
Malachobatus Focke, Abh. Naturwiss.
Vereine Bremen 4: 187 (1874). Type: not
designated

About 127 species, mostly eastern and south-
eastern Asia, also Malesia, Australia, western
Pacific islands.

Shrubs, prickles present; leaves mostly
simple, entire or lobed. Glands absent. Stipules
free, on the twigs near the petiole base, mostly
more or less divided. Inflorescence terminal,
paniculate. Flowers mostly bisexual, carpels
mostly 30–180; fruits red, succulent.

Rubus alceifolius Poir. in Lam., Encycl. 6: 247
(1804); *R. moluccanus* var. *alceifolius* (Poir.)
Kuntze, Meth. Sp.-Besch. Rubus 56 (1879).
Type: Java, 1766–69, *P. Commerson* s.n. (holo:
P–JU, microfiche!).

For synonymy, see Kalkman (1984).

Illustrations: W.T. Parsons & E.G. Cuthbertson,
Noxious Weeds of Austral. (1992: 576);
D.L. Jones & B. Gray, Climbing Pl. in Austral.
(1988: 331).

Erect shrubs, sometimes semi-scandent, up to
6 m high. Stems hairy, with stout, curved to
almost straight prickles to 4 mm long. Leaves
simple. Petioles 35–55 mm long, terete, hairy,
with a few stout prickles. Stipules rather
caducous, orbicular in outline, to 15 mm long,
15 mm wide, divided almost to the base, with
linear lobes; attached to stem at petiole base.
Blades of leaves broadly ovate to orbicular,
85–150(–200) × 70–130(–200) mm, shallowly
5–7-lobed; upper surface green, hairy,
comprising sparse long straight hairs and dense
short stiff hairs; lower surface brown or
yellowish, densely hairy, with short curly hairs
almost or completely obscuring the leaf surface,
and longer straight, spreading hairs on the veins;
glands absent; base cordate; apex acute;
margins serrate, with serrations 1–1.5 mm deep.
Leaves palmately at base, then pennately
with 2–3 pairs of lateral veins, terminating at a
major tooth; venation reticulate, midrib and
lateral veins flat to slightly impressed above,
raised below, prickles occasionally present.
Inflorescences terminal or in upper leaf axils,
up to 100 mm long, each with up to 10 flowers.
Bracts broadly ovate in outline, to 17 mm long,
deeply pinnatisect, segments linear, acute, hairy
outside, glabrous inside. Pedicels terete,
5–14 mm long, sessile glands absent. Flowers

bisexual. Flower buds globular, hypanthia shallowly convex to almost flat, densely hairy, unarmed or with a few short prickles. Sepals persistent, ovate, 9–10 × 5.5–7 mm, outer ones with 5–7 prominent linear lobes, inner ones not or scarcely lobed; sepals recurved at fruiting stage, and becoming somewhat larger; with dense white hairs on both surfaces, prickles absent. Petals not persistent, orbicular, shortly clawed, 7–9 × 7–8.5 mm, glabrous, white, apex obtuse. Stamens 200–280; filaments up to 5.5 mm long, glabrous; anthers c. 0.75 mm long, versatile, dorsifixed, with several hairs at apex. Carpels 110–180, glabrous, glands absent; ovaries c. 1.0 mm long, styles c. 0.9 mm long. Carpels extending to base of torus, annulus of hairs present at base of torus. Collective fruit globular, c. 16 × 16 mm when dried, c. 25 × 25 mm when fresh, exocarp red at maturity. Endocarpids reniform to ovoid, rugose, c. 2.5 × 1.7 × 1.3 mm.

Selected specimens: Queensland. COOK DISTRICT: 6 km E of Babinda, Dec 1992, *Bean* 5332 (BRI); c. 2 km SW of Bramston Beach on road from Bruce Hwy, Aug 1989, *Blaxell* 89/160 et al. (NSW); Palmerston Highway c. 10 km from Millaa Millaa, Nov 1979, *Clarkson* 2731 (BRI); c. 40 km SE of Atherton at Josephine Falls, Aug 1981, *Croat* 52636 (NSW); c. 11 mls [18 km] from Innisfail near Waugh's Pocket, May 1952, *Everist* 5087 (BRI); S.F. 310 Gadgarra, track to Yeti Ridge, end of Fuller road, Jul 1995, *Forster* PIF17129 & *Figg* (BRI, K, MEL, NSW, QRS); Swipers flat, Wooroonooran N.P., Jul 1995, *Forster* PIF17148 & *Figg* (BRI, MEL, NSW); Churchill Ck, Churchill LA, SF 143, Jul 1995, *Forster* PIF17199 & *Figg* (BRI, MEL, NSW, QRS); Cape Kimberley road, Nov 1995, *Forster* PIF18178 (BRI, QRS); SFR 755, Bartle Frere, Boonjee L.A., Mar 1993, *Gray* 5642 (QRS); Danbulla, May 1961, *Hyland* 1859 (BRI); Cucania, near junction of Russell and Mulgrave Rivers, *Thorne* 23132a et al. (BRI); Bellenden Ker, Mar 1922, *White* 1261 (BRI); Babinda, Jan 1923, *White* s.n. (BRI). NORTH KENNEDY DISTRICT: 1 km W of Paluma, NW of Townsville, May 1992, *Bean* 4412 (BRI, K, MEL, NSW); Tam O'Shanter S.F. 1137, Mission Beach-Tully road, Jul 1995, *Forster* PIF17356 (BRI, MEL, NSW, QRS); 14 km NW of South Johnstone, Oct 1988, *Jessup* GJM2514 et al. (BRI); 11 km N of Tully on Bruce Highway, Apr 1975, *Orchard* 4657 (BRI); Mission Beach, Feb 1980, *Stanley* 80255 (BRI). PORT CURTIS DISTRICT: Quinns Gap road, c. 12.5 km NW of Carmila, Jul 1994, *McDonald* 6056 et al. (BRI).

Distribution and habitat: *R. alceifolius* is indigenous to south-east Asia, from southern China to Indonesia, as far east as Sulawesi (Celebes). Naturalised populations in Australia extend from Cape Tribulation to Tully, with two disjunct populations further south at Paluma and Carmila (Map 1). It grows in

thickets on the edges of mesophyll or notophyll rainforest, and on other disturbed sites where rainforest once grew.

Phenology: Flowers have been recorded throughout the year; fruits have been recorded between May and August.

Notes: *R. alceifolius* is closely related to *R. moluccanus*, but can be readily distinguished by the deeply divided bracts and stipules with filiform segments, the leaves which are 5–7-lobed and often orbicular in outline, the globular flower buds, the indumentum on the adaxial leaf surface which comprises a mixture of long and short hairs (long hairs only in *R. moluccanus*) and the greater number of carpels and stamens per flower.

I support the widely held belief that this species is naturalised in Australia. *R. alceifolius* was not recorded by F.M. Bailey during the Bellenden Ker Expedition in 1889, nor in Bailey (1900). It was first collected in Australia by C.T. White in March 1922, from Bellenden Ker (presumably near the railway siding of that name), and shortly after from Babinda. The species is apparently continuing to spread, as some recent collections are a long way from the first recorded locations.

R. alceifolius is considered a serious weed in Eacham, Johnstone and Mulgrave Shires, and is a Declared Plant, Category P3 under the *Queensland Rural Lands Protection Act* (1985–88), where 'infestations must be reduced'.

Rubus moluccanus L., Sp. Pl. 1197 (1753).

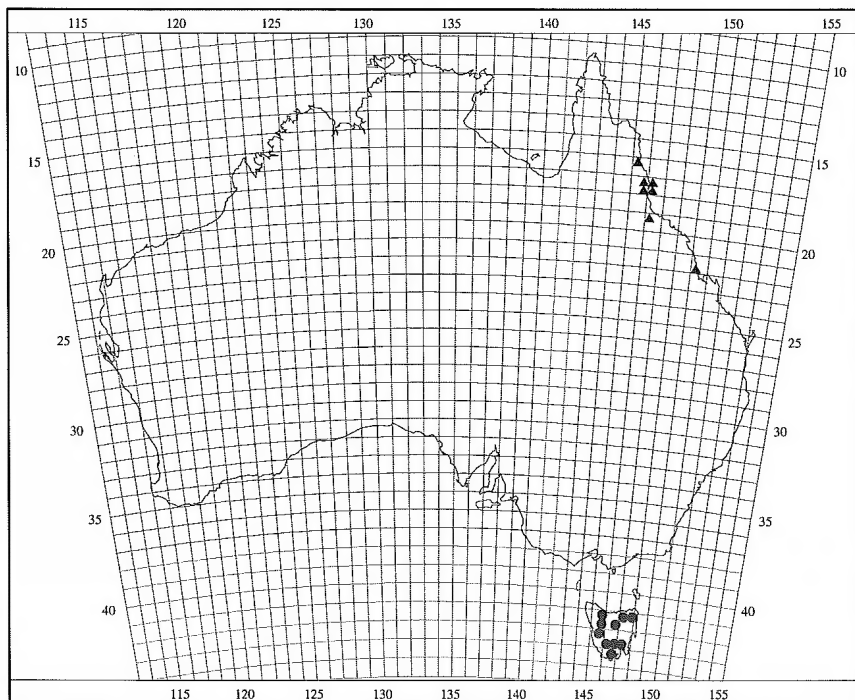
Type: plate 47, fig. 2, in Rumphius, Herb. Amboin. 5: 88 (1747).

Rubus haskarlii subsp. *dendrocharis* Focke, Biblioth. Bot. 72: 99 (1910); *R. dendrocharis* (Focke) Focke, Bot. Jahrb. Syst. 54: 70 (1916); *R. moluccanus* var. *dendrocharis* (Focke) P. Royen, Phan. Monogr. 2: 106 (1969). **Type:** Bele River, 18 km NE of Lake Habbema, Nov 1938, *Brass* 11387 (neo: A, fide Royen (1969); iso: BRI).

For further synonymy, see Kalkman (1984).

Erect shrubs, sometimes semi-scandent, up to 6 m high. Stems hairy, with stout, curved to almost straight prickles to 2 mm long. Leaves simple. Petioles 22–52 mm long, slightly grooved on upper surface, hairy, with a few stout prickles. Stipules caducous, elliptic in outline, to 12 mm long, 6 mm wide, undivided at base, with linear lobes; attached to stem at petiole base. Blades of leaves ovate to broadly ovate, 45–150 × 40–125 mm, shallowly 3–5-lobed or prominently 3-lobed, or sometimes entire; upper surface green, sparsely hairy, comprising long straight hairs only; lower surface brown or yellowish, densely hairy, with short curly hairs obscuring the leaf surface, and longer straight, appressed or spreading hairs on the veins, glands absent; base cordate to auriculate, but adjacent lobes only rarely touching each other; apex acute or occasionally obtuse; margins serrate, with serrations 1–2 mm deep. Leaves palminerved at base, then penninerved with 5–7 pairs of lateral veins,

terminating at a major tooth; venation reticulate, midrib and lateral veins flat to slightly impressed above, raised below, prickles occasionally present. Inflorescence terminal or in upper leaf axils, up to 120 mm long, with up to 15 flowers. Bracts ovate to broadly ovate in outline, to 9 mm long, deeply pinnatisect, segments linear, acute, hairy outside, glabrous inside. Pedicels terete, 6–11 mm long, sessile glands absent. Flowers bisexual. Flower buds ovoid, hypanthia shallowly convex to almost flat, densely hairy, unarmed. Sepals persistent, deltate, 6–9 × 4–5 mm, without an acumen, entire or with 3–5 short lobes, recurved at fruiting stage, and becoming somewhat larger; with dense white hairs on both surfaces, prickles absent. Petals not persistent, broadly ovate, not or shortly clawed, 6–8 × 4–5.5 mm, glabrous or sparsely hairy, white or pink, apex obtuse. Stamens 60–110; filaments up to 4 mm long, glabrous; anthers c. 0.75 mm long, versatile, dorsifixed, glabrous or with several hairs at apex. Carpels 35–70, glabrous, glands absent; ovaries c. 0.9 mm long, styles



Map 1. Distribution of ▲ *Rubus alceifolius* and ● *R. gunnianus*.

c. 7.5 mm long. Carpels extending to base of torus, annulus of hairs present at base of torus. Collective fruit globular or oblate, c. 10 × 13 mm when dried, c. 12 × 16 mm when fresh, exocarp red at maturity. Endocarpids reniform to ovoid, lacunose, c. 2.3 × 1.5 × 1.5 mm.

Two varieties occur in Australia; *R. moluccanus* var. *moluccanus* and *R. moluccanus* var. *trilobus*.

Rubus moluccanus* L. var. *moluccanus

Rubus hillii F.Muell., Trans. & Proc. Philos. Inst. Victoria 2: 67 (1857). **Type:** Queensland. MORETON DISTRICT: Brisbane River, post Feb 1855, *W.Hill* s.n. (holo: MEL [MEL 31307]; iso: K).

Rubus capricorni Focke, Annuaire Conserv. Jard. Bot. Geneve 20: 106 (1917). **Type:** Queensland. COOK DISTRICT: Kamerunga near Cairns, 1885–89, *O.Warburg* 18628 (holo: B, destroyed).

Rubus moluccanus var. *austropacificus* P.Royen, Phan. Monogr. 2: 113 (1969) ('austropacifica'). **Type:** Bougainville. Tuareruku village W of Toiunonapu Plantation, S of Kieta, 4 July 1963, *P. van Royen* NGF 16444 (holo: L n.v.; iso: BRI).

Leaves 85–130 × 60–125 mm, shallowly 3–5-lobed, with sinuses <10 mm deep, or entire; young stems, petioles and veins of the lower leaf surface with erect or spreading, long straight hairs, as well as short curly hairs which obscure the lamina; petals white.

Selected specimens: Queensland. COOK DISTRICT: c. 14 mls [23 km] NNW of Daintree, Nov 1967, *Boyland & Gillieatt* 415 (BRI, MEL, NSW); Black Mountain road, near Kuranda, Jan 1968, *Brass* 33753 (QRS); c. 1 km S of Kuranda on road to Wrights Lookout, Jan 1980, *Clarkson* 2752 (BRI, QRS); near Mt Haig, c. 4.5 km NNW of Danbulla, Nov 1979, *Clarkson* 2722 (BRI, L, QRS); 32 km along road to Leo Creek, McIlwraith Range, Jun 1995, *Forster* PIF16821 (BRI, K, MEL, NSW, QRS); Home Rule, Jul 1995, *Forster* PIF17289 & *Figg* (BRI, MEL, NSW, QRS); Nissen Creek, Mt Perseverance road, Jul 1995, *Forster* PIF17178 & *Figg* (BRI, QRS); Timber Reserve 14, Kesteven, Oct 1981, *Hyland* 11152 (QRS); Noel L.A., N of Tinaroo Falls Dam, Nov 1981, *Kanis* 2152 (BRI, CANB). NORTH KENNEDY DISTRICT: just W of Paluma, NW of Townsville, Feb 1992, *Bean* 3948 (BRI);

top of Seaview Range escarpment, Trebonne-Mt Fox road, Apr 1985, *Rodd* 4485 & *Hardie* (BRI, MEL, NSW); headwaters of Dryander Creek, Mt Dryander, Feb 1971, *Webb & Tracey* 10073 (BRI, CANB); Wilkin Hill, Hinchinbrook Is., May 1972, *Webb & Tracey* 12011 (BRI, CANB, QRS). SOUTH KENNEDY DISTRICT: Mt Blackwood, Mar 1987, *Thompson* 79 (BRI). WIDE BAY DISTRICT: Gheerulla Falls, Mapleton S.F., Nov 1990, *Bean* 2684 (BRI, NSW); Kin Kin, Jan 1917, *White* s.n. (BRI, K). MORETON DISTRICT: Mt Cougal N.P., Upper Currumbin Creek, Mar 1997, *Bean* 11765 (BRI, MEL, NSW); 2.5 mls [4.0 km] SW of Nambour, Jan 1970, *Parsons* s.n. (BRI); Mt Glorious, Dec 1950, *StJohn* 24402 (K). New South Wales. NORTH COAST: Richmond River, undated, coll. unknown (NSW [NSW394747]); Clarence River, undated, ?*Moore* (MEL [MEL 31326]).

Distribution and habitat: *R. moluccanus* var. *moluccanus* is native to south-east Asia, including Thailand, throughout Malesia and extending to Fiji (Kalkman 1984). In Australia, it is indigenous to coastal areas from northern Queensland to northern New South Wales (Map 2), although no collections have been made in New South Wales for over 100 years. It grows in open locations within or fringing notophyll or mesophyll rainforest, or sometimes in open forest with (for example) *Eucalyptus grandis* W.Hill ex Maiden at altitudes from sea-level to 1140 metres.

Phenology: Flowers and fruits have been recorded for most months of the year.

Note: Bentham (1864) recorded *R. moluccanus* for the Northern Territory based on a specimen with the label 'Port Efsington [Essington?], Armstrong'. This distributional record was subsequently repeated by Ewart & Davies (1917) and appears in several popular publications of recent years. However, the record appears to be erroneous. Firstly, the specimen in question belongs in *R. moluccanus* var. *discolor* (Bl.) Kalkman, a taxon not recorded for Australia, but common in Malesia and the islands of the western Pacific. Secondly, *R. moluccanus* is not otherwise known from the Northern Territory, based on both herbarium records and the comprehensive atlas provided by Liddle et al. (1994). Furthermore, no *Rubus* species has been seen by botanists of the Northern Territory Herbarium (DNA) (C. Dunlop, pers. comm.).

Armstrong is known to have collected in Timor for some years (Britten & Boulger 1931), and it is likely that the 'Port Essington' specimen has originated from Timor, and that a misplacement of specimen labels has occurred.

Typification: The holotype of *R. capricorni* was destroyed during World War II. Isotypes were sought from E, K, BM, FI, G and W, but without success. The protologue is sufficiently detailed to allow placement of this name as a synonym of *R. moluccanus* var. *moluccanus*.

Conservation status: *R. moluccanus* var. *moluccanus* is a widespread and common taxon. No conservation coding is recommended.

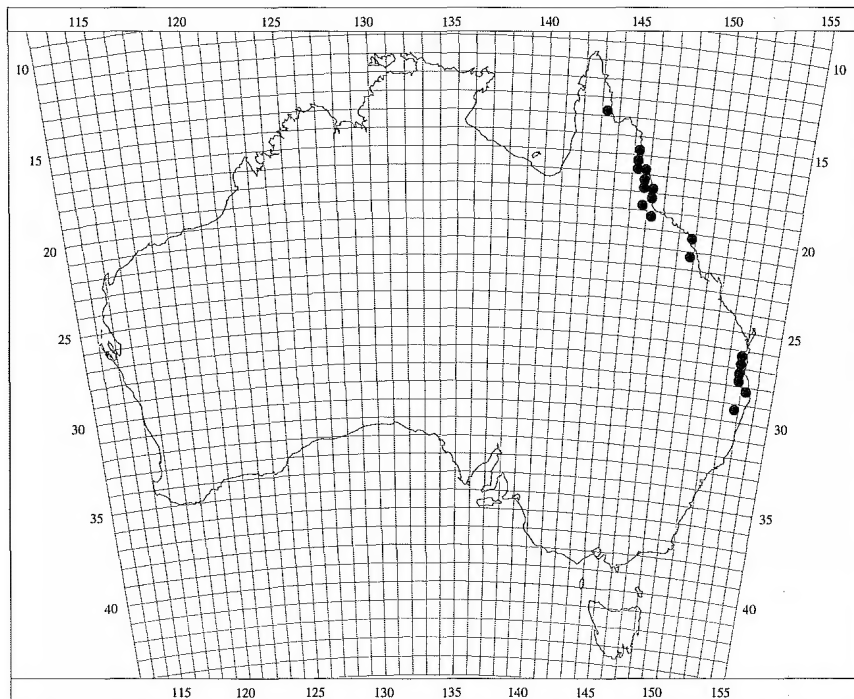
***R. moluccanus* var. *trilobus* A.R.Bean var. nov. varietati *moluccanae* affinis, sed**

foliis conspicue trilobis lobo suo terminali longitudine dimidium folii excedenti, indumento plerumque adpresso et petalis saepe roseis, differens. **Typus:** New South Wales. NORTHERN TABLELANDS: Giro State Forest, between Walcha and Gloucester, 10 December 1996, A.R. Bean 11477 (holo: BRI; iso: K, L, MEL, NSW).

[*R. hillii* auct. non F.Muell.]

Illustration: G.R. Cochrane et al., *Fl. & Plants of Victoria & Tasmania*, p. 97 (1980), as *R. hillii*.

Leaves 45–110 × 40–100 mm, deeply 3-lobed, with sinuses >10 mm deep, and terminal lobe c. two-thirds of leaf length; young stems, petioles and veins of the lower leaf surface with appressed or sometimes spreading, long straight hairs, as well as short curly hairs which obscure the lamina; petals usually pale or deep pink, but sometimes white.



Map 2. Distribution of *Rubus moluccanus* var. *moluccanus*.

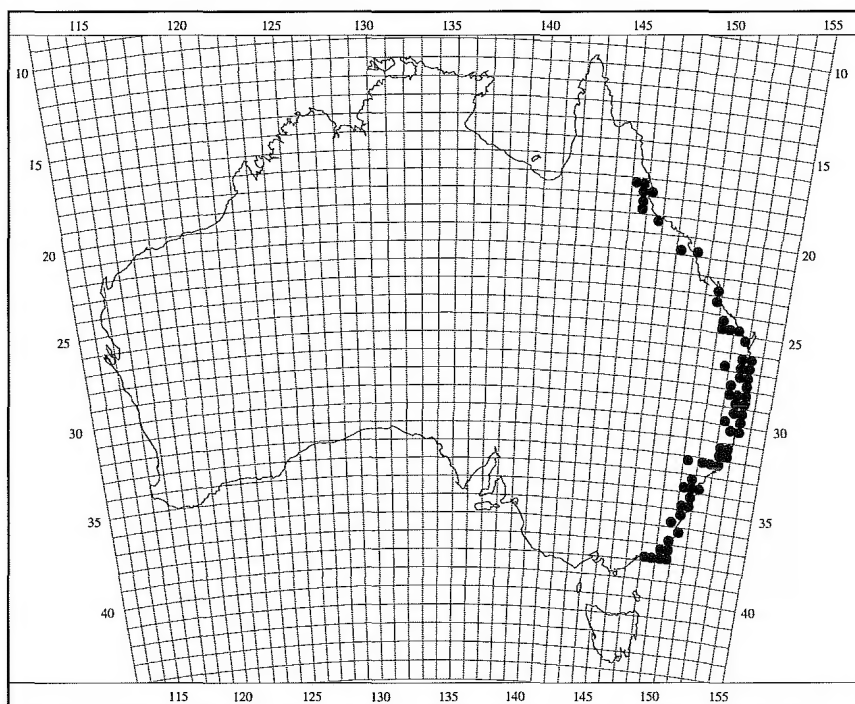
Selected specimens: Queensland. COOK DISTRICT: Sylvia Creek c. 4 km W of Atherton, Nov 1979, *Clarkson* 2742 (BRI, QRS). NORTH KENNEDY DISTRICT: Mt Graham, Rockingham Bay, *Dallachy* s.n. (MEL); Magnetic Island, around summit of Mt Cook, Aug 1982, *Sandercoe* 903 (BRI). SOUTH KENNEDY DISTRICT: Carlisle Island, 35 km N of Mackay, Sep 1986, *Sharpe* 4466 et al. (BRI). PORT CURTIS DISTRICT: Mt Maria, c. 65 km NW of Bundaberg, Nov 1993, *Bean* 7003 (BRI, DNA); Rockhampton, Apr 1868, *O'Shanesy* 99 (MEL). WIDE BAY DISTRICT: Middle road, near Kenilworth-Jimna road, Dec 1990, *Bean* 2710 (BRI, CANB, MEL). DARLING DOWNS DISTRICT: Spicers Gap, Main Range N.P., via Aratula, May 1995, *Bean* 8643 (BRI, MEL). MORETON DISTRICT: Mount Mistake, Nov 1930, *Hubbard* 5217 (BRI, K). **New South Wales.** NORTHERN TABLELANDS: Mt Boss SF, 45 km NW of Wauchope, May 1975, *Coveny* 6375 et al. (K). NORTH COAST: Dalmorton State Forest, SW of Grafton, Aug 1994, *Bean* 7766 (BRI); Toonumbar, NW of Kyogle, May 1949, *Constable* NSW10543 (K, NSW). CENTRAL TABLELANDS: Murdering Gully, Kanangra, 10 miles [16 km] SE of Jenolan Caves, May 1965, *Constable* 5906 (K, NSW); foot of Katoomba Falls, Blue Mts, Dec 1950, *StJohn* 24604 (K, NSW). CENTRAL COAST: Bulli Pass, Apr 1896, *Morrison* 5271 (K, NSW). SOUTH COAST: Mt Dromedary, Couria Creek, Mar 1980, *Craven* 5422 (BRI, CANB, MEL, NSW); McCarthys Ck, Tantawangalo S.F., Dec 1990, *Crawford* 1249 (MEL, NSW). **Victoria.** Howe Ranges, N of Marshmead, Nov 1969, *Beaughole* 31453 & *Willis*

(MEL); Scout Camp Rd, Major Ck crossing, 5.1 km N of Orbost, Aug 1979, *Forbes* 140 (MEL, NSW); Newtons Ck, near Cabbage Tree Creek, Dec 1910, *StJohn* s.n. (K, MEL).

Distribution and habitat: *R. moluccanus* var. *trilobus* is endemic to Australia, and it extends from the Atherton Tableland in north Queensland to far eastern Victoria (Map 3). It commonly grows in gullies or sheltered situations in open eucalypt forest, and also on the edges of notophyll rainforest. In north Queensland it is confined to altitudes above c. 500 metres, but elsewhere it may extend to sea-level.

Phenology: Flowers and fruits have been recorded from every month of the year.

Notes: The rank of variety has been chosen for this taxon, because it differs from *R. moluccanus* sens. str. only in the leaf shape, characters of the indumentum and the often pink petals; and because this rank is compatible with the treatment of Kalkman (1984). The



Map 3. Distribution of *Rubus moluccanus* var. *trilobus*

name *R. hillii* has long been misapplied to this taxon.

Conservation status: *R. moluccanus* var. *trilobus* is a widespread and common taxon. No conservation coding is recommended.

Rubus x novus Kuntze, Meth. Sp.-Besch. *Rubus* (1879). **Type:** New South Wales. NORTH COAST: Hastings River, in 1862, *H. Beckler* s.n. (lecto, here designated: K).

Rubus x illegitimus Focke, Annuaire Conserv. Jard. Bot. Geneve 20: 106 (1917). **Type:** Queensland. DARLING DOWNS DISTRICT: Toowoomba, 1885–89, *O. Warburg* 18629 (holo: B, destroyed).

Rubus x novae-cambriae Gand., Bull. Soc. Bot. France 65: 25 (1918). **Type:** New South Wales. CENTRAL COAST: Menangle, Oct 1893, *R.T. Baker* s.n. (holo: LY n.v., photo at NSW).

Sprawling shrubs, sometimes semi-prostrate, up to 1 m high. Stems hairy, with stout, curved to almost straight prickles to 2.5 mm long. Leaves up to 105 mm long, usually trifoliate, rarely simple but then deeply 3-lobed. Petioles 10–44 mm long, grooved on upper surface, hairy, with a few stout prickles. Petiolules of lateral leaflets absent or up to 1 mm long, grooved, hairy; petiolules of terminal leaflets 0–11 mm long, grooved above, hairy. Stipules persistent, linear, to 12 mm long, 1.5 mm wide, usually 2-lobed, sometimes these lobes further divided; apex acute, attached at junction of petiole and stem. Blades of leaflets ovate, 25–75 × 2–50 mm, the terminal leaflet often larger than the lateral ones; upper surface green, sparsely hairy, comprising long straight hairs only; lower surface white or yellowish, densely hairy, with short curly hairs obscuring the leaf surface, and longer straight, appressed or spreading hairs on the veins; glands absent; base broadly cuneate or obtuse, sometimes oblique in lateral leaflets; apex acute; margins serrate, with serrations 1–3 mm deep. Leaflets penninerved with 4–6 pairs of lateral veins, terminating at a major tooth; venation reticulate, midrib and lateral veins impressed above, raised below, prickles occasionally present.

Inflorescence terminal or in upper leaf axils, up to 80 mm long, with up to 10 flowers. Bracts 3–5-partite, to 9 mm long, segments linear, acute, hairy outside, glabrous inside. Pedicels terete, 4–20 mm long, hairy, glands absent. Flowers bisexual. Flower buds ovoid, hypanthia shallowly convex to almost flat, hairy, unarmed. Sepals persistent, deltate, 5.5–7 × 2.5–3.5 mm, including a 0.5–2.5 mm long acumen, entire or occasionally with small lobes, recurved after anthesis; with dense white hairs on both surfaces, prickles absent. Petals not persistent, elliptical, clawed, 6–8 × 4–5 mm, glabrous or with some hairs on outer surface, pink. Stamens 50–80, glabrous; filaments up to 4.5 mm long, anthers c. 0.75 mm long. Carpels 40–50, glabrous, glands absent; ovaries c. 1.0 mm long, styles c. 5.5 mm long. Carpels extending to base of torus, annulus of hairs present at base of torus. Fruits never formed.

Selected specimens: **Queensland.** SOUTH KENNEDY DISTRICT: headwaters of East Funnel Creek, SSE of Sarina, Sep 1993, *Champion* 862 (BRI). PORT CURTIS DISTRICT: Reedy Creek, 8 km SE of Lowmead on Bundaberg road, May 1976, *Rodd* 3046 & *Jacobs* (NSW). BURNETT DISTRICT: Mt Perry, undated, *Keys* s.n. (BRI). DARLING DOWNS DISTRICT: Cherry Plain Lookout track, Bunya Mountains N.P., May 1996, *Grimshaw* PG2470 & *Grimshaw* (BRI, NSW). MORETON DISTRICT: 6.5 km WNW of Bellthorpe Hall, towards Forestry station, Feb 1989, *Bean* 1004 (BRI); foothills of Mt Ballow, downstream from Grace's Hut, Dec 1989, *Bean* 1287 (BRI, L, NSW); 7 km NW of Mt Glorious, Jan 1990, *Bean* 1331 (BRI, L, NSW); Tamborine Mtn, Dec 1926, *White* 3344 (BRI). **New South Wales.** NORTH COAST: Maclean, Feb 1913, coll. unknown (NSW); Gloucester, Jan 1882, *Betche* s.n. (NSW); Ramornie, 3 miles [5 km] NW of Copmanhurst, Jul 1922, *Blakely & Shiress* s.n. (NSW); Laurieton (Camden Haven), Nov 1944, *McComish* s.n. (NSW). CENTRAL WESTERN SLOPES: Murrumbidgee, May 1986, *Cherry* s.n. (NSW). CENTRAL TABLELANDS: Bundanoon, Feb 1897, *Steel* s.n. (NSW). CENTRAL COAST: Pulbah Island, Lake Macquarie, Nov 1929, *Cheel* s.n. (NSW); Bulli, Dec 1888, *Fletcher* s.n. (NSW); Point Clare, Jun 1897, *Forsyth* s.n. (NSW); Machin's Crater, 5.5 miles [8.8 km] SSE of Glenbrook, Mar 1970, *Pickard* 953 (NSW). SOUTH COAST: Kiah (or Towamba) River c. 2.5 km NE of Kiah, Nov 1976, *Jacobs* 2880 (NSW). **Victoria.** 4 km NE Goongerah, Orbost region, Jan 1986, *Chesterfield* 651 (MEL).

Distribution and habitat: *R. x novus* has been recorded along the eastern Australian coast, from Mackay in Queensland to eastern Victoria (Map 4). It grows close to notophyll rainforest or in tall eucalypt forest, dominated by species such as *Eucalyptus saligna* Sm. and *E. microcorys* F.Muell.

Phenology: Flowers have been recorded between June and March.

Conservation status: *R. x novus* is a widespread and common taxon. No conservation coding is recommended.

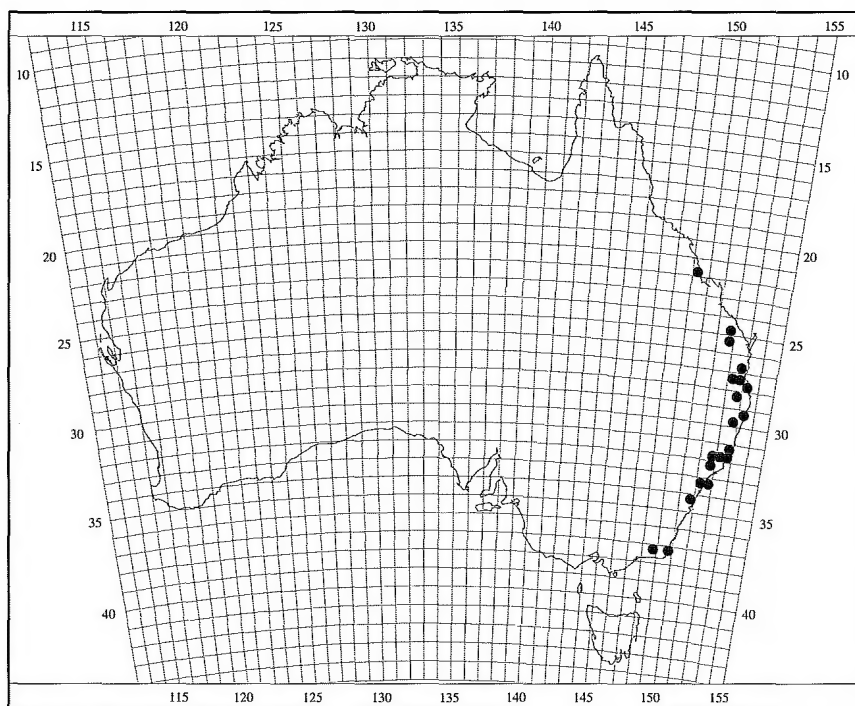
Notes: *R. x novus* is a naturally occurring hybrid, between *R. moluccanus* var. *trilobus* (of *R.* subg. *Malachobatus*) and *R. parvifolius* L. (of *R.* subg. *Idaeobatus*). It is the only known hybrid between indigenous Australian *Rubus* taxa, and is perhaps the only naturally occurring inter-subgeneric hybrid for the genus *Rubus*, although Kalkman (1984) speculated on the existence of an inter-subgeneric hybrid for a specimen he collected (No. 4856). I have not seen this specimen.

R. x novus is sterile. While it flowers well, no fruits have ever been collected or reported, and I have never seen any, despite actively searching for them.

Typification: Kuntze (1879) clearly states that he saw a specimen from Hastings River, New South Wales at the Herbarium of the Royal Botanic Gardens, Kew and as the protologue agrees with this specimen, it is chosen as the lectotype for the name *Rubus x novus*.

The holotype of *R. x illegitimus* was destroyed during World War II. Isotypes were sought by the present author from E, K, BM, FI, G and W, but without success. The protologue is sufficiently detailed to allow placement of this name as a synonym of *R. x novus*.

***Rubus* subg. *Diemenicus* A.R.Beansubg. nov.**



Map 4. Distribution of *Rubus x novus*

Herba rhizomate repente, sine aculeis; folia omnia radicalia, petioli e basi vaginantes, stipulae nullae; flores solitarii, unisexuales, carpellis 6–10; glandulae breviter pedunculares in petiolis foliis pedunculis ovarisque adsunt; fructus rubri, succulenti.

Typus: *R. gunnianus* Hook.

A monotypic subgenus.

Rhizomatous creeping herb, prickles absent, leaves all radical, petioles sheathing at base, stipules absent; flowers solitary, unisexual, carpels 6–10; shortly stalked glands present on petioles, leaves, peduncles and ovaries; fruits red, succulent.

Etymology: Named for Van Diemen's Land, now known as Tasmania, where the type species is endemic.

Rubus gunnianus Hook., Icon. Pl. 3: t. 291 (1840). **Type:** Tasmania. Chilton, Surrey Hills, 16 February 1837, *R. Gunn* 271/1837 (lecto: K, here designated; isolecto: NSW [NSW385192]).

Illustrations: Cochrane et al., Fl. and Plants of Victoria & Tasmania, p. 112 (1980); Macoboy et al. (eds), Gard. Encyc. of Pl. & Flowers, p. 321 (1992).

Prostrate herbs, lacking prickles, rhizomatous. Vertical stems 1–10 mm long, rarely to 50 mm, glabrous, prickles absent. Leaves borne in clusters at each node; up to 60 mm long, mostly with 3 leaflets, but with unifoliate leaves often present at base of cluster. Petioles 12–36 mm long, grooved on upper surface, sheathing at base with sparse, simple white hairs and stipitate red glands. Petiolules of lateral leaflets 0–0.5 mm long, grooved, glands present; petiolules of terminal leaflets 0–3 mm long, grooved above, glabrous, glands present. Stipules absent. Blades of terminal leaflets broadly ovate, 9–19 × 7–14 mm, the lateral leaflets broadly ovate, 6–8 × 4.5–5 mm; glabrous or with sparse hairs along midrib, glands stipitate, red, turning black with age, rather sparse; base broadly cuneate or obtuse, sometimes oblique in lateral leaflets; apex acute; margins serrate to deeply lobed. Leaflets penninerved with 2–4 pairs of lateral veins,

branching before the margin and terminating at a sinus; venation reticulate, midrib and lateral veins impressed above, raised below. Inflorescence axillary, solitary. Bracts ovate, entire, to 6 mm long, glabrous or with sparse hairs and glands along margins, apex obtuse. Peduncles terete, 4–16 mm long, with white hairs, stipitate glands present. Flowers functionally unisexual. Flower buds globular, hypanthia obconical, sparsely hairy. Sepals persistent, deltate to ovate, 4–5.5 × 2.5–3.5 mm, entire; with sparse white hairs on both surfaces. Petals not persistent, narrowly elliptical, not clawed, 6–10 × 2–4.5 mm, glabrous, white. Stamens 16–23, glabrous; filaments up to 2.5 mm long, anthers c. 0.75 mm long. Carpels 6–10, glabrous; glands numerous per carpel, shortly stalked; ovaries c. 0.8 mm long, styles c. 0.75 mm long. Torus small, hairy between the carpels; annulus of hairs absent at base of torus. Collective fruit globular, c. 10 × 10 mm when dried, of unknown size when fresh, exocarp red at maturity; carpels 2–4 per fruit. Endocarps ellipsoidal, lacunose, c. 4.5 × 2.5 × 2.5 mm.

Selected specimens: **Tasmania.** NORTH WEST: Waratah, Dec 1914, *Lucas* s.n. (NSW). Ringwood, Nov 1841, *Milligan* 152 (HO). BEN LOMOND: summit of Mt Maurice, Dec 1979, *Buchanan* 71 (HO); Mt Barrow, Jan 1922, *Rupp* s.n. (MEL). WEST COAST: Trig station of Raglan Range, Dec 1984, *Collier* 156 (HO); Linda track, Jan 1903, *Rodway* 214 (HO); Lake Rhona, Denison Range, Jan 1977, *Tyler* s.n. (HO). CENTRAL HIGHLANDS: Cradle Valley, Dec 1931, *Anderson* 9 (HO); Drys Bluff, NE face, just below the summit, Dec 1984, *Buchanan* 4932 (HO); below Eldon Bluff, Feb 1987, *Buchanan* 9970 (HO); Micklethwaite Marsh, Mar 1985, *Morris* 8535 (HO); King William Range, Nov 1933, *Rodway* 154 (HO). MT. FIELD: Lake Fenton, Nov 1914, *Gibbs* 6508 (BM); Mt Field N.P., Jun 1979, *Noble* 28843 (HO); near Lake Dobson huts, Mt Field N.P., Jan 1978, *Smith* 237 (HO). MT. WELLINGTON: Mt Wellington, Jan 1892, *Bailey & Shirley* (BRI); Mt Wellington, Feb 1891, *Rodway* s.n. (MEL). SOUTH WEST: Southern Jubilee Range, Jan 1985, *Buchanan* 5396 (HO); 3 km ESE of Mt Mueller, Dec 1990, *Collier* 4958 (HO); Hartz Mountain, Apr 1901, *Rodway* 214 (HO).

Distribution and habitat: *Rubus gunnianus* is endemic to the island of Tasmania, where it is apparently common in many places between altitudes of 620–1280 metres (Map 1). Its most commonly recorded habitat is amongst alpine or sub-alpine shrubbery, but it is also recorded from Buttongrass (*Gymnoschoenus sphaerocephalus* (R.Br.)

Hook.f.) plains, shady gullies and dolerite cliffs.

Phenology: *R. gunnianus* produces flowers from November–February and fruits from January–April.

Notes: *R. gunnianus* has no close relatives. While Focke (1910) placed it in *R.* subg. *Dalibarda*, he also stated that “*R. gunnianus* and *R. dalibarda* truly constitute two characteristic subgenera”.

A new subgenus is here erected to accommodate *R. gunnianus*, as it has some characteristics unique for *Rubus*, or at least its non-woody members. These include i) leaves in rosettes, often arising directly from the rhizome, or with short erect branches; ii) absence of stipules (unlike all other creeping *Rubus*); iii), broad petioles sheathing at their bases; iv) prominent glands on the carpels, unlike all other herbaceous species of *Rubus*; v) flowers often (perhaps always) unisexual, with either stamens or carpels being imperfectly developed (Curtis 1956; Rodway in litt.), and this can be observed in the herbarium. All other herbaceous Rubi are bisexual, except *R. chamaemorus* L., which is dioecious (Bailey 1941); vi) The major lateral veins in the leaves terminate at a sinus. This occurs in no other *Rubus* species that I have examined, and hence this is possibly another unique characteristic, although the available data are very limited.

According to Focke (1910), *R. gunnianus* is the smallest of all *Rubus* species.

Typification: The lectotype comprises four separate pieces (two bearing flowers and two bearing fruit), in a horizontal row across the centre of the sheet, and labelled “Mr Gunn 271/1837, Van D. Land, ripe fruit at Chilton, Surrey Hills, 16/2/37”. Two of these pieces appear to form the basis of the illustrations accompanying the protologue. Other specimens mounted on the same sheet are dated 1840 and 1845, and could not have been used by Hooker in drawing up his description. Hence they are excluded from forming part of the type.

The isoelectotype at NSW consists of the mounted material only. The material in the

packet was collected by J. Milligan and is hence excluded.

Conservation status: *R. gunnianus* is reported to be common throughout its habitat, and is present in at least two National Parks. No conservation coding is recommended.

Acknowledgements

Specimens from several herbaria have been examined; I would like to thank the Directors of AD, BM, HO, K, MEL, NSW, PERTH and QRS for specimen loans. Laurie Jessup and Barry Conn searched for type specimens on my behalf during their terms as Australian Botanical Liaison Officer. Philip Sharpe kindly translated Kuntze’s paper relating to *R. x novus*. Paul Forster collected specimens from north Queensland at my request. Gordon Guymer commented on a draft of this paper. Peter Bostock assisted in the translation of some Latin text, and provided the Latin diagnoses.

References

- BAILEY, F.M. (1900). *Rubus*. In *The Queensland Flora* 2: 526–8. Brisbane: H.J. Diddams & Co.
- BAILEY, L.H. (1941). Species Batorum: The Genus *Rubus* in North America (north of Mexico). *Gentes Herbarum* 5: 1–932.
- BEAN, A.R. (1995). A revision of *Rubus* subg. *Micranthobatus* (Focke) Kalkman (Rosaceae) in Australia. *Austrobaileya* 4: 321–8.
- (1997). A Revision of *Rubus* subg. *Idaeobatus* (Focke) Focke (Rosaceae) in Australia. *Austrobaileya* 4: 677–89.
- BENNETT, E.M. (1987). Rosaceae. In Marchant, N.G. et al., *Flora of the Perth Region*, 1: 207–11. Perth: Western Australian Herbarium.
- BENTHAM, G. (1864). *Rubus*. In *Flora Australiensis* 2: 429–32. London: L. Reeve & Co.
- BRITTEN, J. & BOULGER, G.S. (1931). *A Biographical Index of Deceased British and Irish Botanists*, 2nd edition. London: Taylor & Francis.
- CURTIS, W.M. (1956). *The Student’s Flora of Tasmania, Part I*. Tasmania: Government Printer.
- EWART, A.J. & DAVIES, O.B. (1917). *The Flora of the Northern Territory*. Melbourne: Minister for Home and Territories.

- FOCKE, W.O. (1910). Species Ruborum Monographiae generis Rubi Prodomus. *Bibliotheca Botanica* 17 (72 Part 1): 1–120.
- GLEASON, H.A. (1952). *New Britton & Brown Illustrated Flora* 2: 318. New York: New York Botanical Gardens
- HARDEN, G.J. & RODD, A.N. (1990). Rosaceae. in G.J. Harden (ed.), *Flora of New South Wales* 1: 528–50. Sydney: New South Wales University Press.
- KALKMAN, C. (1984). The Genus *Rubus* (Rosaceae) in Malesia 2. The subgenus *Malachobatus*. *Blumea* 29: 319–86.
- KUNTZE, O. (1879). *Methodik der Speciesbeschreibung und Rubus*. Leipzig: Arthur Felix.
- LIDDLE, D.T., RUSSELL-SMITH, J., BROCK, J., LEACH, G.J. & CONNORS, G.T. (1994). *Atlas of the Vascular Rainforest Plants of the Northern Territory*. Canberra: Australian Biological Resources Study.
- ROYEN, P. VAN (1969). The Genus *Rubus* (Rosaceae) in New Guinea. *Phanerogamarum Monographiae Tomus II*. Lehre: J. Cramer.
- SCOGGAN, H.J. (1978). Rosaceae. in *The Flora of Canada* 3: 898–967. Ottawa: National Museums of Canada.
- SYMON, D.E. (1986). *Rubus*. In Jessop & Toelken (eds.) *Flora of South Australia* 1: 446–9.
- THOMPSON, M.M. (1997). Survey of Chromosome Numbers in *Rubus* (Rosaceae: Rosoideae). *Annals of the Missouri Botanic Garden* 84: 128–64.
- WEBB, C.J., SYKES, W.R. & GARNOCK-JONES P.J. (1988). *Rubus*, in *Flora of New Zealand, Volume IV, Naturalised Pteridophytes, Gymnosperms, Dicotyledons*. Christchurch: Botany Division DSIR.

***Madangia inflata* (Asclepiadaceae: Marsdenieae), a new genus and species from Papua New Guinea**

Paul I. Forster, David J. Liddle and Iris M. Liddle

Summary

Forster, Paul I., Liddle, David J., Liddle, Iris M. (1997). *Madangia inflata* (Asclepiadaceae: Marsdenieae), a new genus and species from Papua New Guinea. *Austrobaileya* 5(1): 53–57. The new genus *Madangia* is described with the sole species *M. inflata* P.I.Forst., D.J.Liddle & I.M.Liddle. *M. inflata* is thus far known only from the Madang Province of Papua New Guinea. The genus is closely allied to *Hoya* R.Br. to which it is compared.

Keywords: Asclepiadaceae, Marsdenieae, *Hoya*, *Madangia* - Papua New Guinea; *Madangia inflata*.

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Introduction

The authors are working towards a revision of the genera *Hoya* R.Br. and *Dischidia* R.Br. (both Asclepiadaceae: Marsdenieae) as they occur in Australia and Papuasias. In 1992 the first two authors collected numerous live material of *Hoya* in north-east Papua New Guinea, particularly in Madang Province. One of the plants, collected at the time without flowers and with the vegetative appearance of a species of *Hoya*, has now subsequently flowered in cultivation and is not referable to that genus. This plant represents not only an undescribed species, but an undescribed genus, which although allied to *Hoya*, differs in numerous ways from all taxa included in that genus. This species is described as *Madangia inflata* in the present paper and its affinities discussed. There appear to be no previous herbarium collections of this plant that has rather remarkable, showy, white, globose flowers and is of considerable horticultural merit.

Madangia P.I.Forst., D.J.Liddle et I.M.Liddle
genus novum. Genus singulare in Asclepiadaceis: Marsdenieis per corollam globosam et formam loborum coronae staminalis. Lobi coronae staminalis membranei et sibi contigui (autem non

connati) secus longitudinem paene omnino praeter apices supernos lanceolatos prope apicem styli et margines inferos columna staminali multo longiores. Margo inferus quisque columnae staminalis valde recurvus in extremitate necnon segmenta membranacea involutiones corollae interposita format.

A genus unique within the Asclepiadaceae: Marsdenieae by virtue of the globose corolla, and the form of the staminal corona lobes. The staminal corona lobes are membranous and contiguous (but not fused) to each other for almost their entire length, apart from the upper lanceolate apices near the style head and the lower edges that are much longer than the staminal column. The lower edge of each staminal corona lobe is strongly recurved at the end and forms a membranous frill positioned between involutions of the corolla wall.

Type species: *Madangia inflata* P.I.Forst., D.J.Liddle & I.M.Liddle

Epiphytic twiner; latex white. Roots fibrous. Leaves petiolate; lamina fleshy, hairy; with collectors. Inflorescence deciduous, usually single at a node, umbelliform to racemiform, positively geotropic. Flowers pedicellate. Sepals 5. Corolla globose, fleshy-membranous;

tube much inflated, of 5 completely fused petals; lobes free at tips, valvate. Annular and corolline coronas absent; staminal corona of 5 membranous lobes that are contiguous with but not fused to each other, each lobe attached to the back of each anther that make up the fused staminal column, lower edge of lobe strongly flanged away from central part of flower and strongly recurved with a somewhat frilled margin that is positioned between involutions of the corolla wall; interstaminal corona absent. Stamens connate into gynostegium (staminal column), not markedly capitate. Anthers 2-locular with terminal appendage; pollen in linear tetrads; pollinaria with 2 erect, oblong pollinia with a pellucid germinating mouth on outer margin; corpusculum oblong-ovate; caudicles not winged, not geniculate. Style-head rounded. Follicles and seeds not seen.

A monotypic genus, endemic to Papua New Guinea.

Etymology: The generic name is formed from the geographical region of Madang Province in north-east Papua New Guinea.

Madangia inflata P.I.Forst., D.J.Liddle et I.M.Liddle **sp. nov.** Volubilis lenta; indumento trichomatum incoloratum simplicium multicellularum. Caules usque ad metra plura longi ad interque internodos radicanes, trichomatibus sparsis; internodia usque ad 200 mm longa et 2 mm diametro, lenticellata demum. Petioli cylindrici, 8–12 mm longi, 1.5–3.5 mm diametro, leviter sulcati supra, trichomatibus sparsis antroris. Colletri rotundati 1 vel 2 basi laminae. Lamina folii elliptica usque ad 120 mm longa et 60 mm lata, apice acuta usque ad breve acuminata, basi cordata lobis superpositis; venatio ex venis 6 vel 7 lateralibus arenatis et et venis interlateralibus reticulatis indistinctis constans; pagina supra viridis venatione ± obscura trichomatibus dispersis; pagina infera pallide viridis venatione indistincta trichomatibus dispersus usque ad sparsis. Pedunculi florentes 8–22 mm longi,

1.5–2 mm diametro, trichomatibus dispersis floribus usque ad 9 ornati; bractea ovato-truncata, 0.4–0.5 mm longa, 0.5–0.8 mm lata, sparse ciliata. Flores 12–14 mm longi, 17–18 mm diametro; pedicelli 32–45 mm longi, 1.4–1.5 mm diametro, glabri. Sepala triangularia, c. 1 mm longa et 2 mm lata. Corolla 12–13 mm longa, 17–18 mm diametro, alba; tubus 12–14 mm longa, 17–18 mm diametro, glaber, basi sub sepalis protrusa eaque occulta, apice in centro depresso; lobi 5–6 mm longi, 6–7 mm lati, apice leviter recurvi, intra breve papillati. Corona staminalis c. 8 mm longa et 10 mm diametro; apices loborum apicem styli aequantes. Columna staminalis c. 4 mm longa et 3 mm diametro; antherae appendices lanceolatae c. 1 mm longae et 0.7 mm latae; fissura alaris 0.8–1 mm longa sub antheris non prolongata. Apex styli c. 1 mm longus et 1 mm diametro. Pollinaria c. 0.96 mm longa et 0.77 mm lata; pollinia 0.77–0.78 mm longa, 0.29–0.31 mm lata; corpusculum 0.38–0.43 mm longum, 0.21–0.24 mm latum; caudiculae 0.11–0.14 mm longa, 0.5–0.9 mm lata. latiores in extremo corpusculari. **Typus:** Cultivated at Emerald Creek, Mareeba (from plant collected Papua New Guinea. MADANG PROVINCE: Headwaters Dom River, 4°58'S, 145° 45'E), 26 Nov 1995, I.M.Liddle IML1076 (holo: BRI [1 sheet + spirit]).

Wiry twiner; indumentum of uncoloured simple multicellular trichomes. Stems to several metres long, rooting at and between nodes, with sparse trichomes; internodes up to 200 mm long and 2 mm diameter, lenticillate with age. Leaf petioles cylindrical, 8–12 mm long, 1.5–3.5 mm diameter, faintly grooved along top, with sparse antrorse trichomes; colleters rounded, 1 or 2 at lamina base. Leaf lamina elliptic to elliptic-ovate, fleshy, up to 120 mm long and 60 mm wide; tip acute to shortly acuminate; base cordate with the lobes overlapping; venation of 6 or 7 looping lateral veins and indistinct reticulate interlateral veins; upper surface green, venation ± obscure, with scattered trichomes; lower surface pale green, venation indistinct,

with scattered to sparse trichomes. Flowering peduncles 8–22 mm long, 1.5–2 mm diameter, with scattered trichomes, with up to 9 flowers; bracts ovate-truncate, 0.4–0.5 mm long, 0.5–0.8 mm wide, sparsely ciliate. Flowers 12–14 mm long, 17–18 mm diameter; pedicels 32–45 mm long, 1.4–1.5 mm diameter, glabrous. Sepals triangular, c. 1 mm long and 2 mm wide, glabrous. Corolla 12–13 mm long, 17–18 mm diameter, white; tube 12–14 mm long, 17–18 mm diameter, glabrous, base protruding down below sepals and obscuring them, top depressed in centre; lobes 5–6 mm long, 6–7 mm wide, slightly recurved at top, shortly papillate inside. Staminal corona c. 8 mm long and 10 mm diameter; lobe tips level with style-head. Staminal column c. 4 mm long and 3 mm diameter; anther appendages lanceolate, c. 1 mm long and 0.7 mm wide; alar fissure 0.8–1 mm long, not continuing down below anthers. Style-head c. 1 mm long and 1 mm diameter. Pollinaria c. 0.96 mm long and 0.77 mm wide; pollinia 0.77–0.78 mm long, 0.29–0.31 mm wide; corpusculum 0.38–0.43 mm long, 0.21–0.24 mm wide; caudicles 0.11–0.14 mm long, 0.5–0.9 mm wide, wider at corpusculum end. Fig. 1.

Additional specimens examined: Known only from the type collection and live plants in cultivation.

Distribution and habitat: *Madangia inflata* is known only from the single type collection. Plants grow as twig epiphytes in the canopy of lowland complex mesophyll vineforest on volcanic soil. *Hoya kenejiana* Schltr. and miscellaneous ferns and orchids grow in association. Plants recorded in the surrounding forest include *Tabernaemontana aurantiaca* Gaud., *T. pandacqui* Lam., *Aglaia* sp., *Graptophyllum pictum* (L.) Griff., *Pittosporum* sp., *Popowia* sp., *Casearia* sp., *Rinorea horneri* (Korth.) O.Kuntze, *Maniltoa psilogyne* Harms and *Polyalthia* sp.

Notes: *Madangia inflata* is unique in the Marsdenieae for its globose corolla and the form of the staminal corona. Globose corollas are rare in the Marsdenieae, the only regional example being the Australian *Gunnessia pepo* P.L.Forst. (Forster 1990). *Madangia inflata* does not appear closely allied to *Gunnessia pepo*

which has a totally dissimilar staminal corona and pollinaria. Globose corollas are more common, but still rare, in the Stapelieae (sensu Bruyns & Forster 1991), with convergently similar examples to *Madangia* being found in *Echidnopsis malum* (Lavranos) Bruyns (Bruyns 1988) and *Stapeliopsis neronis* Pillans (Bruyns 1981), both stem succulents from Africa. Unlike *Echidnopsis malum*, *Gunnessia pepo* and *Stapeliopsis neronis*, the staminal column of *Madangia inflata* is not further enclosed by a tubular staminal corona within the enclosing corolla.

Madangia inflata is undoubtedly most closely allied to *Hoya* as it has a similar habit, and apart from the globose corolla and staminal corona, has a similar floral morphology to many species especially those in Papuasia. Globose corollas are extremely uncommon in *Hoya* with the only known example being *H. heuschkeliana* Kloppenburg from the Philippines. The corolla lobes in *H. heuschkeliana* are not as completely fused as in *M. inflata* with an obvious suture along the margins of each lobe, nor are they anywhere as large. Apart from its globose corolla, *H. heuschkeliana* has a staminal corona typical of *Hoya*.

The recently described *H. telosmoides* Omlor from Sabah is also worth mentioning here. This species has a corolla with a markedly inflated tube that has a constricted mouth and narrow lobes (Omlor 1996). These characters are not found in other species of *Hoya*, but *H. telosmoides* has a similar staminal corona to other species of that genus and Omlor (1996) concluded that it would be best placed there until such time as a monograph of *Hoya* could be undertaken and the status of the infrageneric classification reviewed.

The staminal corona of *M. inflata* differs markedly from that of *Hoya*. In *Hoya* the staminal corona comprises five separate lobes that are attached to the backs of the anthers fused into the staminal column. The lobes are discrete and although well separated in most taxa of *Hoya* may be closely contiguous in some species. The lower edge of each staminal corona lobe in *Hoya* is strongly inrolled along the sides

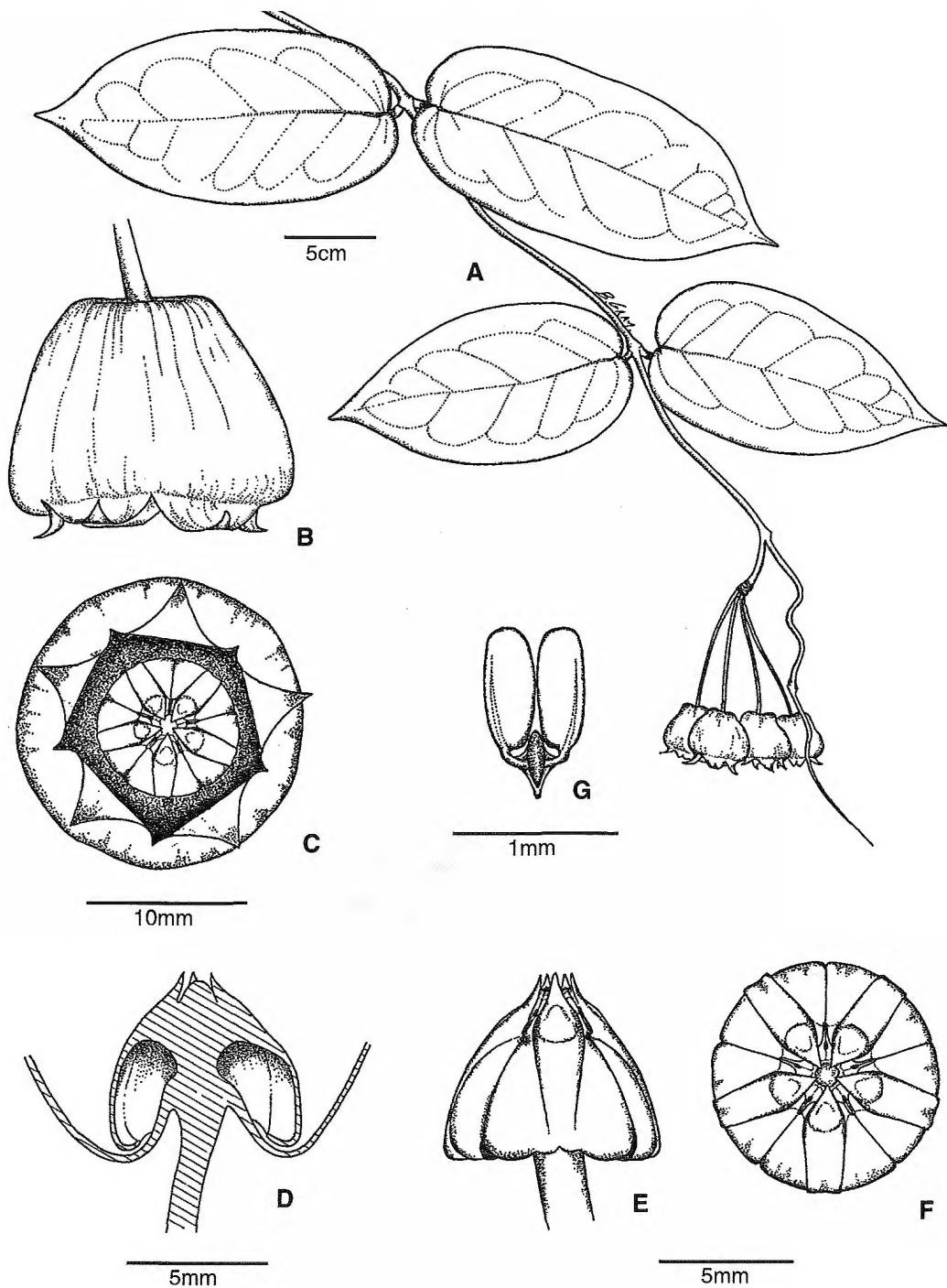


Fig. 1. *Madangia inflata*. A. habit of flowering stem $\times 0.5$. B. side view of flower $\times 3$. C. face view of flower $\times 3$. D. vertical cross-section of lower part of corolla tube, staminal corona and staminal column $\times 3.5$. E. side view of staminal corona and staminal column $\times 3.5$. F. face view of staminal corona and staminal column $\times 3.5$. G. pollinarium $\times 25$. All from live and spirit material of D.J.Liddle IML1076. Del. B.Gray.

forming the 'coronal groove' of Rintz (1978). In *Madangia* the five staminal corolla lobes are contiguous to each other for almost their entire length, apart from the upper apex near the style head and the strongly recurved lower edges. The lower edge of each staminal corona lobe in *Madangia* is recurved at the end, although not at the sides, and forms a membranous frill, rather than a fleshy roll, that is positioned between involutions of the corolla wall. As a result no 'coronal groove' is formed. The only *Hoya* that approaches the staminal corona form of *Madangia* is *H. multiflora* Blume, that is sometimes segregated in the genus *Centrostemma* as *C. multiflorum* (Blume) Decne. In *H. multiflora* the staminal corona lobes do not have a marked 'corona groove', although it is still present, and the lower edge of the lobes are sharply pointed (Rintz 1978). *H. multiflora* is a shrubby plant that never twines, not an uncommon trait in *Hoya*, and has a strongly reflexed rotate corolla. It is feasible that the floral features of a *Hoya* such as *H. multiflora* are plesiomorphic and similar to a putative ancestor to *Madangia*.

The pollinaria of *Madangia inflata* appear similar to those illustrated as group B of Malaysian Hoyas by Rintz (1978), where the caudicles are unwinged and the outer edge of the pollinia have a pellucid germination mouth.

The features of a globose corolla with totally fused corolla lobes, apart from the tips, and contiguous staminal coronal lobes that have a strongly recurved, frilled lower edge are considered derived for *Madangia*. Description of *Madangia* does not lend justification for dismemberment of *Hoya* into segregate groups as has been alluded to on occasion (e.g. Hill 1988). Despite the great morphological variability encompassed within the latter, the species presently recognised within *Hoya* are united by the shared character states of the staminal corona as described above.

Conservation status: The lowland rainforests of Madang Province are being cleared at an alarming rate for saw-logs and woodchips. The type locality for *M. inflata* was a remnant of forest in an almost totally logged (clear-felled) area. Survival of this species in the area of its initial collection is unlikely in the near future.

Etymology: The specific epithet is derived from the Latin *inflatus* (bladdery, thin, membranous and swollen) and alludes to the corolla texture and shape.

Acknowledgements

We are grateful to Bruce Gray of Atherton for the illustrations and Les Pedley (BRI) for the Latin translations. Fieldwork in Papua New Guinea was possible due to a Christensen Research Institute Fellowship in 1992 and the then Director of CRI Dr M. Jebb assisted in various ways.

References

- BRUYNS, P.V. (1981). A review of *Pectinaria* Haw., *Stapeliopsis* Pillans and a new genus *Ophionella* (Asclepiadaceae). *The Cactus and Succulent Journal of Great Britain* 43: 61–83.
- (1988). A revision of the genus *Echidnopsis* Hook.f. (Asclepiadaceae). *Bradleya* 6: 1–48.
- BRUYNS, P.V. & FORSTER, P.I. (1991). Recircumscription of the Stapeliaceae (Asclepiadaceae). *Taxon* 40: 381–391.
- FORSTER, P.I. (1990). Notes on Asclepiadaceae, 2. *Austrobaileya* 3: 273–289.
- HILL, K.D. (1988). A revision of *Hoya* (Asclepiadaceae) in Australia. *Telopea* 3: 241–255.
- OMLOR, R. (1996). Notes on Marsdenieae (Asclepiadaceae) - a new, unusual species of *Hoya* from Northern Borneo. *Novon* 6: 288–294.
- RINTZ, R.E. (1978). The Peninsular Malaysian species of *Hoya* (Asclepiadaceae). *Malayan Nature Journal* 30: 467–522.

***Marsdenia jensenii* (Asclepiadaceae: Marsdenieae), a new species from north-eastern Queensland**

Paul I. Forster

Summary

Forster, Paul I. (1997). *Marsdenia jensenii* (Asclepiadaceae: Marsdenieae), a new species from north-eastern Queensland. *Austrobaileya* 5(1): 59–61. The new species *Marsdenia jensenii* is described and illustrated. It is endemic to north-eastern Queensland in the 'Wet Tropics' region and apparently restricted to a small area near Gadgarra State Forest.

Keywords: Asclepiadaceae, *Marsdenieae*, *Marsdenia* - Australia, *Marsdenia hemiptera*, *Marsdenia jensenii*.

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Introduction

A revision of *Marsdenia* R.Br. in Australia and Papuasias was recently published wherein some seventy-eight species were enumerated (Forster 1995). The following new species was discovered too late to be included in that work, or in the subsequent *Flora of Australia* account (Forster 1996), and is described here.

Taxonomy

Marsdenia jensenii P.I.Forst., sp. nov.
affinis *M. hemipterae* H.Rch. latice albo (contra pellucido usque ad viridiflavo), florum pedicellis 15–25 mm longis (contra 5–13 mm), corollae lobis valde dextris (contra $\pm$ rectis usque ad modice dextris), sepalis orbicularis usque ad orbicularo-ovatis (contra lanceolatis), coronae staminalis lobis apicem styli superantibus (contra non superantibus), poliniis ellipsoideis magnioribus 0.72–0.74 mm longis (contra globoso-ovoideus 0.5–0.55 mm longis) differt.

Typus: Queensland. COOK DISTRICT: State Forest Reserve 310, Gadgarra, track to Yeti Ridge, 17°17'S, 145°44'E, 15 Feb 1995, *R. Jensen* 105 (holo: QRS; iso: BRI). Canopy liane; latex white; indumentum of simple, multicellular trichomes that are uncoloured or

pale golden in colour. Stems woody, lenticillate and up to 5 cm thick with age; internodes up to 150 mm long and 4 mm diameter, with scattered trichomes when young. Leaves petiolate; petioles 30–50 mm long, 1–1.5 mm diameter, grooved on top, with scattered trichomes; colleters rounded to shortly subulate, 6 to 8 at base of lamina. Leaf lamina lanceolate-ovate to ovate, up to 160 mm long and 70 mm wide; tip acute to shortly acuminate; base weakly cordate to almost truncate; venation comprising 9 to 11 primary lateral veins per side of midrib and secondary interlateral reticulate veins; upper surface dark green, primary venation visible but not prominent, glabrous; lower surface pale green, primary and secondary venation prominent, glabrous. Inflorescence racemiform, up to 25 mm long; peduncle 11–15 mm long, c. 1 mm diameter, with sparse trichomes; bracts lanceolate to triangular, 1–1.5 mm long, 0.5–0.7 mm wide, with sparse to dense trichomes; flowers 1–20. Flowers 7–8 mm long, 17–22 mm diameter; pedicels 15–25 mm long, 1–2 mm diameter, with sparse trichomes. Sepals orbicular to orbicular-ovate, overlapping, 5.5–6 mm long, 4–5 mm wide, with scattered trichomes, ciliate. Corolla rotate, 17–22 mm diameter, green outside, faintly purplish inside; tube 1.5–2 mm long, not pouched at top, mainly glabrous but with a few scattered trichomes; lobes lanceolate with a bluntly acute tip, dextrorse, 7–10 mm long, 4.8–5 mm wide, mainly glabrous with a few scattered trichomes towards base, ciliate.

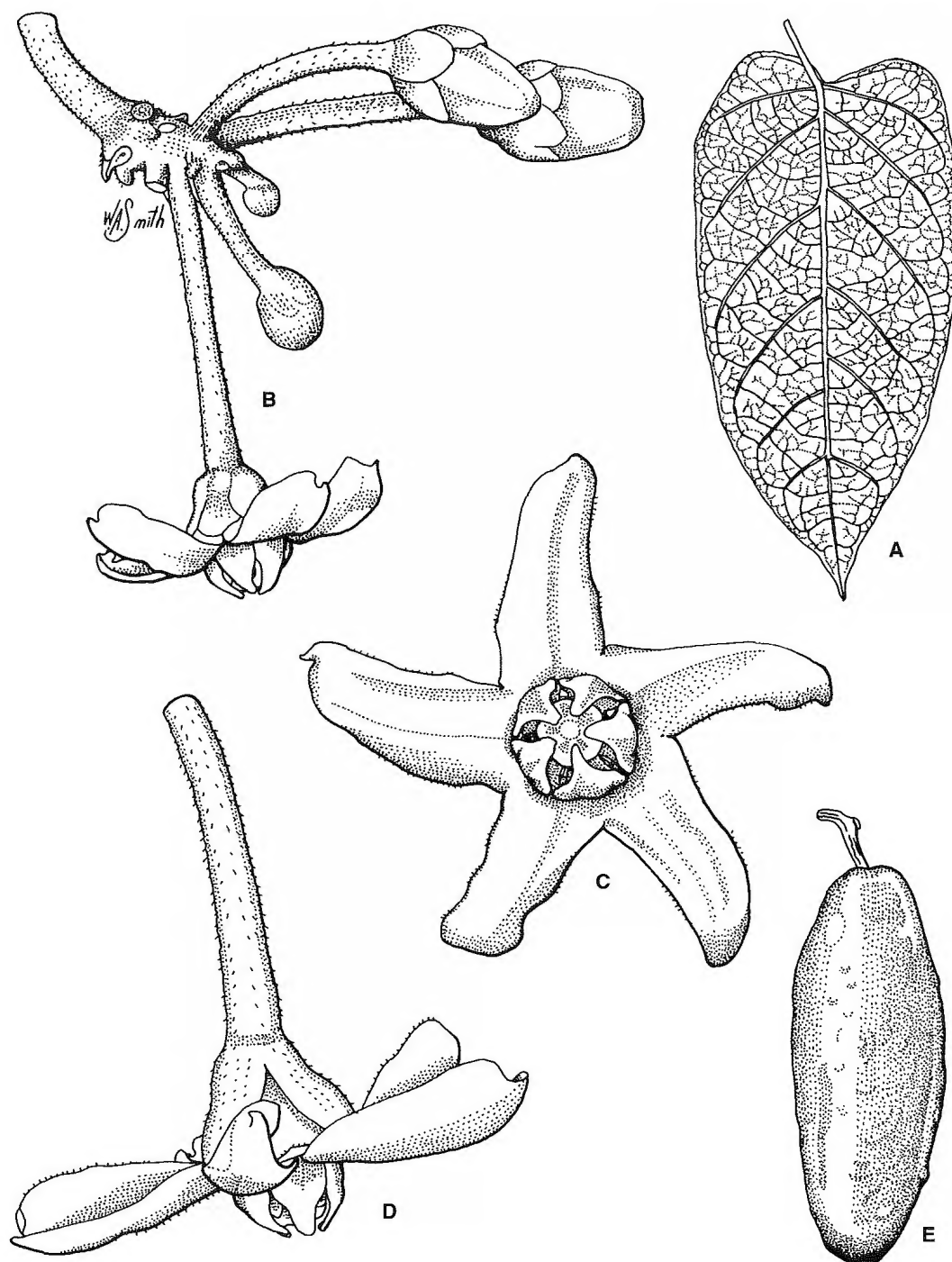


Fig. 1. *Marsdenia jensenii*. A. undersurface of leaf showing lateral and interlateral venation. $\times 0.6$. B. inflorescence $\times 2$. C. face view of flower $\times 3$. D. lateral view of flower $\times 3$. E. lateral view of fruit $\times 0.4$. A & E from Forster 17132 & Jensen (BRI); B–D from Jensen 105 (BRI). Del. W. Smith.

Corolline corona absent. Staminal corona 4–5 mm long, 4–5.5 mm diameter, yellow; lobes in close proximity to one another, tips overtopping style-head, 7–10 mm long, 4.8–5 mm wide, upper portion lanceolate with an irregularly blunt tip, lower portion $\pm$ rectangular. Staminal column c. 4 mm long and 3 mm diameter; anther appendages ovate, 0.8–1 mm long, 0.8–1 mm wide; alar fissure c. 2 mm long. Style-head flattened-umbonate, c. 1 mm long, 2.5–2.8 mm diameter. Pollinaria c. 0.67 mm long and 1.53 mm wide; pollinia ellipsoid, 0.72–0.74 mm long, 0.34–0.36 mm wide; corpusculum oblong-ovate, 0.34–0.38 mm long, c. 0.19 mm wide; caudicles c. 0.95 mm long and 0.43–0.9 mm wide, widest at corpusculum end. Fruit cylindrical-oblong, c. 14.5 cm long and 5.5 cm diameter; seeds not seen. Fig. 1.

Additional specimen examined : Queensland. COOK DISTRICT: S.F.310 Gadgarra, track to Yeti Ridge, Jul 1995, Forster 17132 & Jensen (BRI).

Distribution and habitat: *Marsdenia jensenii* is thus far known only from Gadgarra State Forest at the western base of Bartle Frere, in the 'Wet Tropics' of north-eastern Queensland. Plants grow as canopy lianes in complex notophyll vineforest on soils derived from basalt.

Notes: *Marsdenia jensenii* appears to be related to *M. hemiptera* H.Rch. in general habit and floral morphology and keys to that species in Forster (1995). *M. jensenii* is easily differentiated from *M. hemiptera* on floral characters with its pedicels 15–25 mm long (versus 5–13 mm), strongly dextrorse corolla lobes (versus $\pm$ straight to slightly dextrorse), orbicular to orbicular-ovate sepals (versus lanceolate), staminal corona lobes overtopping the style-head (versus not over-topping), and larger ellipsoid pollinia that are 0.72–0.74 mm long (versus globose-ovoid pollinia that are 0.5–0.55 mm long). The nearly glabrous foliage and white latex of *M. jensenii* also differs from that of *M. hemiptera* which is always beset with ferrugineous (ginger) indumentum and has clear or greenish-yellow latex.

Conservation status: *Marsdenia jensenii* appears to have a distribution largely restricted to Gadgarra State Forest where it appears to be reasonably abundant, as seedlings were common in places. It is highly likely that a detailed survey of the area will reveal further populations and despite the current paucity of herbarium records it is felt that no conservation coding is warranted.

Etymology: The specific epithet honours Rigel Jensen of Malanda who first discovered and collected this species.

Acknowledgements

Thanks to Rigel Jensen for showing me the plant in habitat, Les Pedley (BRI) for the Latin translation, and Will Smith (BRI) for the illustrations.

References

- FORSTER, P.I. (1995). Circumscription of *Marsdenia* (Asclepiadaceae: Marsdenieae), with a revision of the genus in Australia and Papuasia. *Australian Systematic Botany* 8: 703–933.
- (1996). *Marsdenia* (Asclepiadaceae). In A.G.L. Wilson (ed.), *Flora of Australia* 28: 245–267. Melbourne: CSIRO Publications.

A conspectus of *Astrotricha* DC. (Araliaceae) in Queensland, including two new species

A.R. Bean

Summary

Bean, A.R. (1997). A conspectus of *Astrotricha* DC. (Araliaceae) in Queensland, including two new species. *Austrobaileya* 5(1): 63–69. The eleven species of *Astrotricha* DC. indigenous to Queensland are listed in systematic order, with synonymy, place of publication and distribution given. Two new species, *A. brachyandra* and *A. umbrosa*, are described and illustrated. A comprehensive key to Queensland species is included.

Key words: *Astrotricha*, Araliaceae, key, taxonomy, *Astrotricha brachyandra*, *Astrotricha umbrosa*, Australian flora, Queensland

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Introduction

Astrotricha is an endemic Australian genus with representatives in Queensland, New South Wales and Victoria, and one species in Western Australia. Recent research has resulted in the description of several new species (Bean 1991, Makinson 1991, Bean 1995).

The present paper aims to summarise distributional and nomenclatural data on the species indigenous to Queensland, and to present descriptions of two new species.

No new infrageneric classification is proposed, but the published name *A. subg. Hexocenia* Domin is used for the species allied to *A. pterocarpa*.

Taxonomy

A key to Queensland species of *Astrotricha* DC.

1. Leaves > 13 mm wide 2
Leaves < 13 mm wide 7
2. Petioles 5.5–21 cm long; inflorescence > 70 cm long; fruits winged 3
Petioles 0.6–5.0 cm; inflorescence 20–40 cm long; fruits without
wings 5
3. Leaves 9–16 cm wide, base cordate, midrib rounded below **3. *A. cordata***
Leaves 1.7–5.5 cm wide, base obtuse, midrib keeled below 4
4. Inflorescence woolly-hairy, umbels 10–15-flowered, flowers
creamy-white; leaves 1.7–4.0 cm wide **1. *A. pterocarpa***
Inflorescence glabrous, umbels 7–11-flowered, flowers purple; leaves
3.3–5.5 cm wide **2. *A. intermedia***
5. Flowers purple; stems mostly unbranched **4. *A. roddii***
Flowers white or greenish-white; stems branched 6

6. Petioles 2.0–5.0 cm long **11. A. latifolia**
 Petioles 0.6–1.3 cm long **10. A. umbrosa**
7. Leaves less than 7 mm wide 8
 Leaves (6-)7–13 mm wide 9
8. Leaves 3.5–7 mm wide, petioles 4–6 mm long; inflorescence 16–30 cm
 long **6. A. biddulphiana**
 Leaves 2.2–3.5 mm wide, petioles 3–4 mm long; inflorescence 3–9 cm
 long **7. A. pauciflora**
9. Leaves glabrous on both surfaces **8. A. glabra**
 Leaves with dense stellate tomentum on abaxial surface 10
10. Petioles (15-)23–30 mm long; flowers purple **5. A. brachyandra**
 Petioles 3–15 mm long; flowers white 11
11. Tomentum on stems and leaves loose, individual hairs c. 1 mm diameter;
 leaves 11–20 mm wide; pedicels 3–9.5 mm long **10. A. umbrosa**
 Tomentum on stems and leaves tight, individual hairs c. 0.5 mm
 diameter; leaves (6-)7–11 mm wide; pedicels 8–15 mm long **9. A. longifolia**

Astrotricha subg. *Hexocenia* Domin, Biblioth.
 Bot. 89: 485 (1928). **Type:** *Astrotricha*
pterocarpa Benth.

Monopodial shrubs, monocarpic; mericarps
 3-locular, fruits winged (in most species).

- 1. *Astrotricha pterocarpa*** Benth., Fl. Austral.
 3: 379 (1867). **Type:** Queensland. COOK
 DISTRICT: Fitzroy Island, *W. Hill* s.n. (holo:
 K).

A description of this species is given in Bean
 (1991).

Distribution and habitat: *A. pterocarpa* is
 confined to north Queensland where it extends
 from the Melville Range area north of Cooktown
 southwards to Pentland and near Mackay. It
 grows in shallow sandy soil, over sandstone or
 granite, in eucalypt woodland.

- 2. *Astrotricha intermedia*** A.R.Bean,
Austrobaileya 3(3): 524 (1991). **Type:**
 Queensland. LEICHHARDT DISTRICT: Nogoa
 River camping area, Salvator Rosa
 National Park, 9 December 1989,
R.O. Makinson 600 (holo: BRI; iso: CANB,
 NSW).

Illustration: Williams, Native Pl. Queensl.
 3: 31 (1987), as *A. pterocarpa*.

Distribution and habitat: *A. intermedia* occurs
 along the central Queensland coast between
 Marlborough and Rosedale, and west almost
 as far as Tambo. It grows in open eucalypt
 woodland, in shallow sandy soils derived from
 sandstone, granite or sometimes serpentinite.

- 3. *Astrotricha cordata*** A.R.Bean, *Austrobaileya*
 3(3): 523 (1991).
Type: Queensland. LEICHHARDT DISTRICT:
 Blackdown Tableland, c. 35 km SE
 of Blackwater, September 1971,
R.J. Henderson H1018, *L. Durrington*
 & *P. Sharpe* (holo: BRI).

Illustrations: Williams, Native Pl. Queensl.
 2: 47 (1984), as *A. pterocarpa*.

Distribution and habitat: *A. cordata* is
 sporadically distributed in southern
 Queensland from Blackdown Tableland to
 Mundubbera and Biggenden, and west to
 Salvator Rosa N.P. There is one known
 population in New South Wales, north-west of
 Grafton. It inhabits skeletal soils derived from
 sandstone, granite or occasionally rhyolite, in
 open eucalypt woodland.

4. ***Astrotricha roddii*** Makinson, *Telopea* 4(2): 313 (1991). **Type:** New South Wales. NORTH WESTERN SLOPES: Macintyre Falls, 3 km S of junction of Macintyre and Severn Rivers, 23 November 1984, *A.N. Rodd* 4096 (holo: NSW; iso: BRI, MEL).

Illustrations: *Flora of N.S.W.* 3: 82 (1992).

Distribution and habitat: *A. roddii* is mainly distributed on the north-western slopes of New South Wales, particularly around Ashford. There is one population in Queensland, on Mt Bullaganang north-east of Texas. It occurs in shallow sandy acidic soils, with outcropping rocks, in woodland often dominated by *Eucalyptus dealbata* Cunn. ex Schauer and *E. melanophloia* F.Muell.

Note: Although *A. roddii* does not possess the winged fruits characteristic of the other species of *A.* subg. *Hexocenia*, its placement there is supported by its unbranched slender habit and its 3-locular mericarps.

Astrotricha DC. subg. ***Astrotricha***

Branched shrubs, perennial; mericarps 1-locular, fruits not winged.

5. ***Astrotricha brachyandra*** A.R.Bean **sp. nov.**, affinis *A. biddulphiana* autem petiolis multus longioribus, foliis latoribus apice acuminatis, staminibus brevioribus, partibus omnibus inflorescentiae tomento stellato obsitis differt. **Typus:** Queensland. PORT CURTIS DISTRICT: 41 km east of Biloela, in Kroombit Tops S.F., 24°25'S, 150°55'E, 15 November 1995, *E.J. Thompson* BIL207 & *R.J. Price* (holo: BRI; iso: CANB, MEL, NSW, distribuendi).

Shrub to 2 m high, erect, sparsely branched. Stems, petioles and abaxial surfaces of leaves stellate-pubescent, with individual hairs c. 0.1 mm across. Leaves alternate, narrowly lanceolate, 90–140 × 7–13 mm, acuminate, dark green adaxially, pale yellow abaxially, midrib impressed adaxially, raised abaxially; petioles terete, (15-)23–30 mm long. Panicles terminal, up to 60 cm long, densely

stellate-hairy, grey in colour; bracts ensiform, 1.0–2.5 mm long. Unit inflorescence umbellate, 5–9-flowered; peduncles and pedicels slender, pedicels 8–20 (–25) mm long. Flowers bisexual, protandrous, 4–5 mm across. Hypanthium stellate-hairy, 1.2–1.9 mm long at anthesis, campanulate; calyx lobes deltate to semi-orbicular, apex acute or obtuse, c. 0.5 × 0.5 mm, purple, tomentose. Petals 5, deltate, 2.0–2.9 × 1.1–1.5 mm, purple, recurved, caducous; glabrous on adaxial surface, sparsely stellate hairy on abaxial surface; apex acuminate. Stamens 5, alternating with the petals; filaments terete, c. 0.6 mm long; anthers white, c. 1.4 mm long, versatile, dorsifixed, opening by longitudinal slits. Styles 2, 1.0–2.0 mm long; at first erect, later spreading from base, persistent. Ovules 1 per carpel. Fruit a schizocarp, elliptical or somewhat quadrangular in transverse section, 5.0–6.5 mm long, 2.5–3.5 mm wide, 2–3 mm thick, surface stellate-hairy; brown to grey, splitting at maturity; mericarps 1-locular. Fig. 1 G–K.

Specimens examined: Queensland. PORT CURTIS DISTRICT: Kroombit Tops SF (boundary) on ridge above Annies gorge, Dec 1994, *Brushe* JB611 (BRI); creek flowing into Kroombit Ck near Annies Gorge falls, c. 1 km SE of falls, Oct 1995, *Brushe* JB201 (BRI); Kroombit Tops N.P., western section, Aug 1995, *Thompson* BIL114 & *Turpin* (BRI); 41 km E of Biloela, in Kroombit Tops S.F., Oct 1995, *Thompson* BIL181 & *Turpin* (BRI, CANB, MEL, NSW); 21.5 km NE of Biloela, Feb 1996, *Thompson* BIL214 & *Price* (BRI).

Distribution and habitat: *A. brachyandra* is known only from Kroombit Tops east of Biloela and the Callide Range north-east of Biloela. It grows in sandy soils derived from sandstone, as a component of woodland dominated by *Eucalyptus trachyphloia* F.Muell., *E. suffulgens* L.A.S. Johnson & K.D. Hill or *E. cloeziana* F.Muell. Altitudes vary between 600 and 800 metres.

Phenology: Flowers have been recorded from October to December.

Affinities: *A. brachyandra* is closest to *A. biddulphiana*, and shares with that species the purple flowers and obconical fruits. *A. brachyandra* differs by the petioles being (15-)23–30 mm long (4–6 mm long for

A. biddulphiana), leaves 7–13 mm wide with acuminate apex (3.5–7 mm wide with acute apex for *A. biddulphiana*), shorter stamens and presence of stellate tomentum on all parts of the inflorescence.

Conservation status: The risk category for *Astrotricha brachyandra* according to the criteria of Chalson & Keith (1995) is 'priority for investigation' (criterion a), or 2RCi according to the system of Leigh and Briggs (1996). The species is known only from Kroombit Tops and Callide Range, with a total geographical range of about 50 kilometres. The recommended conservation status for this species as defined by the *Queensland Nature Conservation Act 1992* is 'rare'.

Etymology: The species epithet *brachyandra* is derived from the Greek *brachy*-short and *andros*-male, and refers to the short stamens which are a feature of this species.

6. *Astrotricha biddulphiana* F. Muell., Victorian Naturalist 7: 115 (1890). **Type:** Queensland. MARANO DISTRICT: near Mt Playfair, *H. Biddulph* s.n. (holo: MEL? n.v.).

Astrotricha ledifolia var. *glabriflora* F.M. Bailey, Queensland Flora 2: 732 (1900). **Type:** Queensland. near Rockhampton, undated, *O'Shanes* s.n. (holo: MEL, photo!).

Distribution and habitat: *A. biddulphiana* occurs in southern Queensland away from the coast, extending from Lake Elphinstone to Barakula S.F. near Chinchilla, and west to Bull Creek gorge and Mt Playfair. It grows in eucalypt woodland on shallow sandy soils over sandstone or granite.

7. *Astrotricha pauciflora* A.R. Bean, Austrobaileya 4(3): 407 (1995). **Type:** Queensland. MORETON DISTRICT: North Ridge, Mount Barney N.P., 16 July 1994, *A.R. Bean* 7734 & *D.A. Halford* (holo: BRI; iso: CANB, K, MEL, NSW).

Distribution and habitat: *A. pauciflora* is confined to Mt Barney and Mt Maroon, both in the Mt Barney National Park, Queensland,

close to the N.S.W. border. It grows in rocky crevices in low eucalypt woodland or heathland, at altitudes above 600 metres.

8. *Astrotricha glabra* Domin, Biblioth. Bot. 89: 486 (1928); *Astrotricha longifolia* var. *glabrescens* F.M. Bailey, Queensland Agricultural Journal 21(6): 293 (1908). **Type:** Moreton Island, 12–14 September 1908, *C.T. White* s.n. (lecto (here chosen): BRI [AQ 333042]).

Distribution and habitat: *A. glabra* is endemic to south-eastern Queensland and is found on North Stradbroke Island, Moreton Island, Fraser Island and the Cooloola area. It grows under eucalypt forest in deep sands of quaternary age.

Note: In his treatment of *Astrotricha glabra*, Domin (1928) attributes the original publication of a varietal epithet '*glabra*' to F. Mueller in *Fragmenta Phytographiae Australiae* 7: 148. While Mueller did discuss the occurrence of a glabrous form there, he did not provide a description of the plant, nor did he coin the epithet '*glabra*'. The correct authorship citation is hence *A. glabra* Domin.

9. *Astrotricha longifolia* Benth., in S.L. Endlicher et al., Enum. pl. 54 (1837). **Type:** New South Wales. Sydney area (syn: *Bauer* s.n.; *Sieber* 538).

Illustrations: Williams, Native Pl. Queensl. 2: 47 (1984).

Distribution and habitat: *A. longifolia* inhabits coastal areas of southern Queensland and New South Wales. It grows in low woodland dominated by *Eucalyptus* spp. or *Banksia* spp., in sandy soils.

10. *Astrotricha umbrosa* A.R. Bean sp. nov., affinis *A. longifoliae* autem tomento laxiore ex pilis stellatis majoribus constante, foliis plerumque 11–20 mm latis (non 6–11 mm latis), pedicellis 3–9.5 mm longis (non 8–15 mm longis) differt. **Typus:** Queensland. BURNETT DISTRICT: Dead End lookout, Coomingleh S.F., west of Monto, 17 August 1995, *A.R. Bean* 8859 (holo: BRI; iso: CANB, DNA, MEL, NSW).

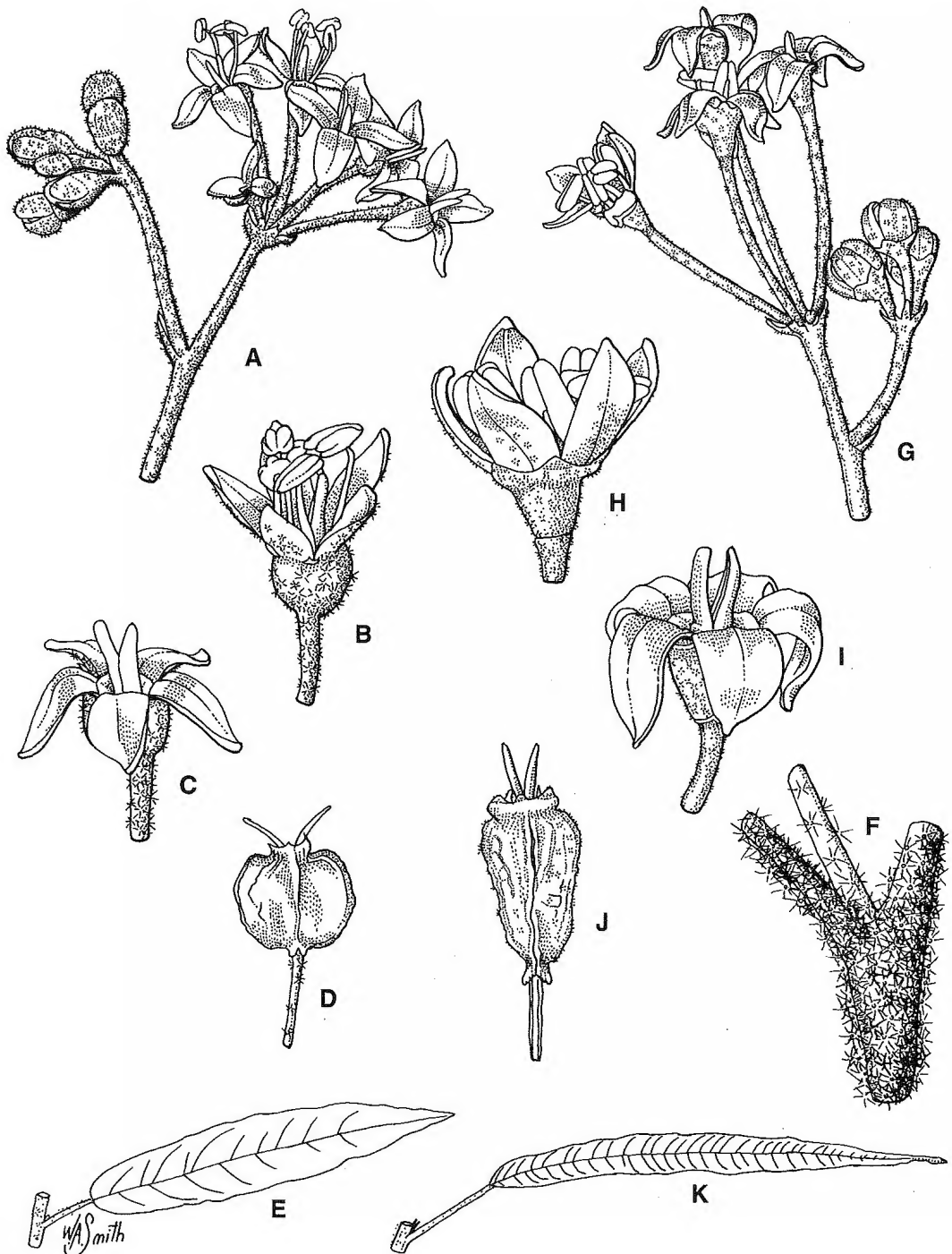


Fig. 1. *Astrotricha umbrosa* A. portion of inflorescence $\times 4$. B. flower at male stage $\times 8$. C. flower at female stage $\times 8$. D. fruit $\times 4$. E. leaf $\times 0.5$. F. stellate hairs $\times 8$. *Astrotricha brachyandra*. G. portion of inflorescence $\times 4$. H. flower at male stage $\times 8$. I. flower at female stage $\times 8$. J. fruit $\times 4$. K. leaf $\times 0.5$. A–C, E, F Bean 9110; D, Bean 2540; G–K, Thompson BIL207 & Price.

Astrotricha sp. (Pomona A.R.Bean 1157) in Bean (1994).

Shrub to 2 m high, erect, well-branched. Stems, petioles and abaxial surfaces of leaves stellate-pubescent, with individual hairs c. 1.0 mm across. Leaves alternate, lanceolate to narrowly lanceolate, (50)70–120 × (8–)11–20 mm, acuminate, dark green adaxially, pale yellow abaxially, midrib impressed adaxially, raised abaxially; petioles terete, 6–13(–17) mm long. Panicles terminal, 10–30 cm long, densely stellate-hairy, brown to yellow in colour; bracts ensiform, 1.7–3.5 mm long. Unit inflorescence umbellate, (4–)5–11-flowered; peduncles and pedicels slender, pedicels 3.0–9.5 mm long. Flowers bisexual, protandrous, 4.5–6.0 mm across. Hypanthium stellate-hairy, 1.0–1.5 mm long at anthesis, campanulate; calyx lobes deltate, apex acute or obtuse, c. 0.4 × 0.4 mm, green to white, stellate-hairy or mostly glabrous. Petals 5, deltate, 1.5–2.5 × 0.7–1.1 mm, white or pinkish, somewhat persistent; glabrous on adaxial surface, stellate hairy on abaxial surface; apex acute to acuminate. Stamens 5, alternating with the petals; filaments terete, c. 1.9 mm long; anthers white, c. 1.1 mm long, versatile, dorsifixed, opening by longitudinal slits. Styles 2, 1.5–2.8 mm long; at first erect, later spreading from base, persistent. Ovules 1 per carpel. Fruit a schizocarp, ± orbicular in outline, 3.3–4.0 mm long, 3.9–4.3 mm wide, 1.2–1.5 mm thick, glabrescent; brown, splitting at maturity; mericarps 1-locular. Fig. 1 A–F.

Specimens examined: **Queensland.** PORT CURTIS DISTRICT: Kroombit Tops SF 316, 48 km E of Biloela, Sep 1988, *Gibson* TOI431 (BRI); near headwaters of Cedar Ck, SF 583, Jul 1995, *Thompson* CAL312 & *Turpin* (AD, BRI, DNA, NSW). BURNETT DISTRICT: near Dead End Lookout, Coomanglah SF, near Monto, Aug 1990, *Bean* 2086 (BRI, MEL, NSW); Cania Gorge NP, c. 600 m W of Mt Dowgo, Nov 1995, *Brushe* JB315 & *Hendry* (BRI); c. 15 km (direct) WNW of Monto, turn-off from Forest Drive to Dead End Lookout, Coomanglah SF, Oct 1988, *Makinson* 550 & *Krauss* (AD, BRI, CANB, CHR, K, MEL, NSW). WIDE BAY DISTRICT: Mt Cooroora, near Pomona, Oct 1989, *Bean* 1157 (BRI); Linda Garrett Park, 2 km W of Mapleton, Oct 1990, *Bean* 2539 (BRI, NSW); Oakey Creek road, Mapleton SF, Oct 1990, *Bean* 2540 (BRI); Scenic Drive, Blackall Range, c. 5 km N of Mapleton, Sep 1988, *Sharpe* 4824 et al. (BRI, NSW). MORETON DISTRICT: Delicia road, Mapleton, Dec 1989, *Bean* 1257 (BRI); Cooloolabin SF, Mapleton Forest Drive, 2 km N of Mapleton, Sep 1989, *Leiper* s.n. (BRI).

Distribution and habitat: *A. umbrosa* is endemic to southern Queensland, extending from Kroombit Tops and the Boyne Valley, to the Mapleton area. It grows in relatively dense and shady open forest dominated by *Eucalyptus* spp. including *E. pilularis* Sm., *E. cloeziana* F.Muell. and *E. acmenoides* Schauer, in sandy or sandy loam soils.

Phenology: Flowering occurs in September–October.

Notes: *A. umbrosa* is similar in appearance to *A. floccosa*, but it differs by its ensiform bracts 1.7–3.5 mm long (filamentous, 2–10 mm long for *A. floccosa*), inflorescences 10–30 cm long (30–100 cm long for *A. floccosa*) and the 5–11-flowered umbels (12–20-flowered for *A. floccosa*).

From *A. longifolia*, it differs by its stellate hairs c. 1.0 mm across (c. 0.5 mm for *A. longifolia*), looser tomentum, leaves mostly 11–20 mm wide (6–11 mm wide for *A. longifolia*), and pedicels 3.0–9.5 mm long (8–15 mm for *A. longifolia*).

Conservation status: The risk category for *Astrotricha umbrosa* according to the criteria of Chalson & Keith (1995) is ‘susceptible’ (criteria e and f), or 2RCi according to the system of Leigh and Briggs (1996). The species is known from about half a dozen widely scattered populations. The recommended conservation status for this species as defined by the Queensland *Nature Conservation Act* 1992 is ‘rare’.

Etymology: The species epithet is from the Latin *umbrosus* meaning shady or growing in shade and refers to the habitat of the species in rather dense, shady forests.

11. *Astrotricha latifolia* Benth., in S.L. Endlicher et al., Enum. pl. 54 (1837); *A. floccosa* var. *incana* Benth., Fl. Austral. 3: 380 (1867); *A. floccosa* var. *latifolia* (Benth.) Domin, Biblioth. Bot. 89: 486 (1928), nom. illeg. **Type:** ‘in collectione Baueriana’ (?W n.v.).

Illustration: Flora of N.S.W. 3: 82 (1992).

Distribution and habitat: *A. latifolia* occurs in southern Queensland south from about Gympie and west to the Great Dividing Range, and along much of the New South Wales coast. It inhabits tall eucalypt forest in high rainfall areas.

Acknowledgements

I am grateful to John Thompson for his persistent efforts to collect good flowering and fruiting material of *A. brachyandra*, to Will Smith for the illustrations, and Les Pedley for the Latin diagnoses.

References

- BEAN, A.R. (1991). Notes on *Astrotricha* DC. (Araliaceae) in Queensland. *Austrobaileya* 3(3): 523–528.
- (1994). *Astrotricha*. In R.J.F. Henderson (ed.) *Queensland Vascular Plants: Names and Distribution*. Brisbane: Queensland Department of Environment and Heritage.
- (1995). A new species and new record for *Astrotricha* DC. (Araliaceae) in Queensland. *Austrobaileya* 4(3): 407–409.
- CHALSON, J.M. & KEITH, D.A. (1995). *A Risk Assessment scheme for Vascular Plants: Pilot Application to the Flora of New South Wales*. Hurstville: National Parks and Wildlife Service.
- DOMIN, K. (1928). *Astrotricha*. In Beiträge zur Flora und Pflanzengeographie Australiens. *Bibliotheca Botanica* 89: 485–487.
- BRIGGS, J.D. & LEIGH, J.H. (1996). *Rare or Threatened Australian Plants*. Melbourne: CSIRO.
- MAKINSON, R.O. (1991). Two new species of *Astrotricha* (Araliaceae) from New South Wales. *Telopea* 4: 313–319.

Cooktownia robertsii, a remarkable new genus and species of Orchidaceae from Australia

David L. Jones

Summary

Jones D.L. (1997). *Cooktownia robertsii*, a remarkable new genus and species of Orchidaceae from Australia, *Cooktownia robertsii* D.L. Jones is described from Queensland. *Austrobaileya* 5(1): 71–78.

Keywords: Orchidaceae - Queensland, Orchidoideae, Orchideae, *Cooktownia robertsii*

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Introduction

Identification of the genus of an unfamiliar species of orchid becomes relatively straight forward with some experience. The generic placement of an extremely unusual terrestrial orchid recently collected in northeastern Queensland, however, has caused considerable difficulty. Embryological studies (Clements pers. comm.) show that the species has similar developmental stages to orchids of the subfamily Orchidoideae, tribe Orchideae (Abe 1972; Fredrikson 1991; Clements 1995). The elongated, somewhat fusiform, asymmetric ovaries, the shape and arrangement of the sepals and petals and the shape of the elements of the column are consistent with this placement. However the paired, broadly ovate, ground-hugging leaves and the thin wiry scape are very different from any Orchidoid species which has been described from the region. The labellum, which is entire, lacks a basal spur, usually considered to be a feature of orchids of this type, but Dressler (1993) notes that a spur may be lacking in some species.

Examination of the flowers of this novelty shows that the column is much modified and would appear to be non-functional. Elements of the anther and stigma occur as simple rod-like analogues (Fig 1.1). The anther analogue can be recognised by its dorsal placement opposite the labellum

(Fig. 1.3 & 1.4) and the presence on its lateral surfaces of aggregates of structures which resemble pollen tetrads (Fig. 1.5, 1.6). Two or four rod-like structures anterior to the anther analogue are apparently much modified stigmas (Fig. 1.2) and/or rostellar arms (for developmental studies in Orchidoid species see Kurzweil 1987). Thus although the flowers of this enigmatic species appear to be superficially normal, the column is much modified and its elements would appear at first sight to be non-functional, lacking pollen and receptive stigmata. Despite these significant reproductive limitations the species is common over a localised natural area and is maintaining a viable population level (L.Roberts pers. comm., C.Broers pers. comm.). Examination of mature ovaries shows that they contain reproductive structures which have an appearance remarkably similar to normal Orchidoid seed (Fig. 2).

Subtribal Placement

The subtribal classification of the Orchideae is difficult and well beyond the scope of this paper. A brief consideration of the subject is necessary since the subtribal characters influence the generic choices for the taxon in question. Dressler (1993) recognised two subtribes within the Orchideae, the Habenariinae and Orchidinae, and at the same time noted that the distinction between them needs reevaluation. In Orchidinae, according to Richard (1818) and Dressler (1993), the

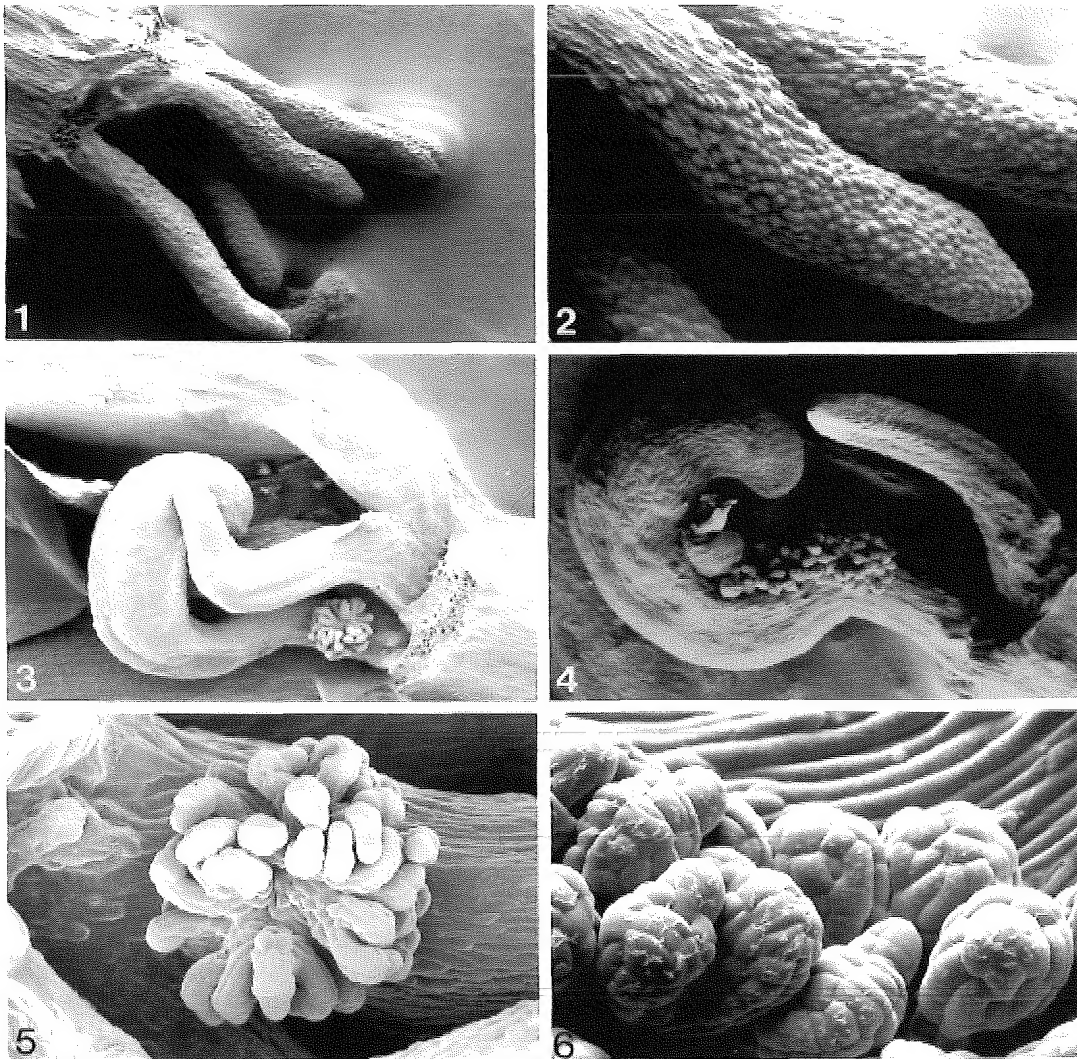


Fig. 1. Scanning electron micrographs of *Cooktownia robertsii*. 1.1. column elements from side (x 36); 1.2. surface structure of stigma analogue (x 100); 1.3 & 1.4 anther analogues from two flowers (x 40); 1.5. site of development of abortive pollen structures (x 165); 1.6. abortive pollen structures (x 430).

columns have a concave stigma, whereas those in Habenariinae have convex, long-stalked stigmas, long rostellar arms and long caudicles (Senghas 1973; Dressler 1993). These characters are not all clear cut as Kurzweil & Weber (1991) found that the stigmas of the Orchidinae are usually convex or pad-like. Linder & Williamson (1986) note that these stigmatic characters are difficult to observe, and

in my view they are also subjective and difficult to interpret. Certainly undue emphasis has been placed on features of the gynostemium in much of this generic classification, resulting in considerable overlap and confusion.

Based on the gynostemium characters, the subtribal placement of the taxon under study is equivocal. Although abortive, the shape of

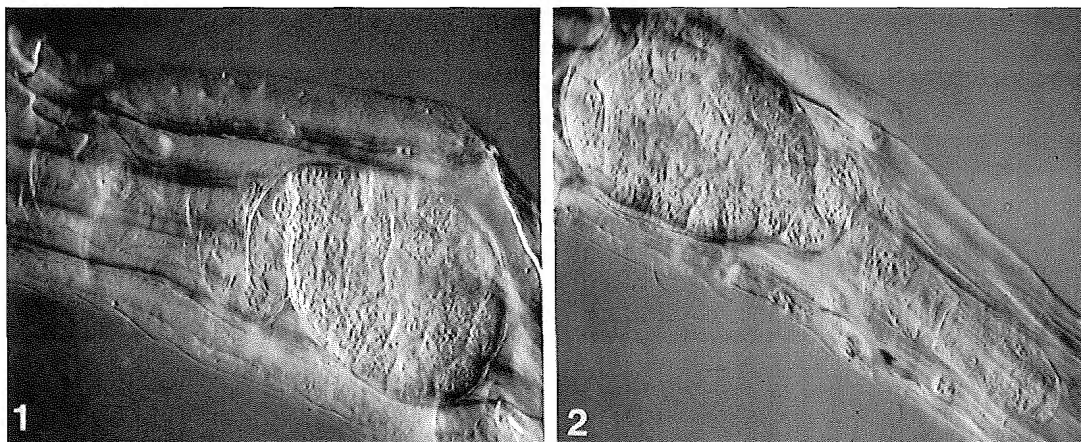


Fig. 2. 2.1 & 2.2. Mature seed-like structures of *Cooktownia robertsii* showing proembryo and supensor (x 35).

the stigma analogues could be considered to be flat to concave and thus consistent with a member of the Orchidinae. Alternatively their elongated shape could place them in the Habenariinae. Because of this subtribal uncertainty, the generic placement of the new species is also uncertain. Dressler (1993) enumerates 34 genera in the subtribe Orchidinae and 23 in the Habenariinae. Several authors (Linder & Williamson 1986, Kurzweil & Weber 1991, Dressler 1993) mention problems in the generic classification of the Orchideae. Even a brief examination of the literature reveals conflicting and confusing views on generic delimitation and characterisation (see for example Ames 1910; Luer 1975; Seidenfaden 1977; Inoue 1983; Yokota 1990; Catling & Sheviak 1993).

The majority of the genera listed by Dressler (1993), are very distinct from the Queensland taxon, a conclusion supported by examination of line drawings and colour illustrations of numerous taxa of Orchideae (for example Luer 1972, 1975). A comparison with the Orchidoid flora of New Guinea and Indonesia, where the genera *Habenaria*, *Peristylus* and *Platanthera* are represented, provides no solution to the problem.

Emphasis has been placed by some authors on the shape and orientation of the root

tubers (see for example Inoue 1983), but a scan through the literature and experience with Australian and New Guinea species of Habenariinae, shows this character to be extremely variable and of limited taxonomic application. Some of the characters of the new taxon, in particular the elongated root tubers and undivided labellum, are similar to species in some sections of the genera *Platanthera* (Ogura 1953; Inoue 1983) and *Peristylus* (Seidenfaden 1977). In both of these genera, however, the flowers have a labellum spur.

Thus the new Queensland taxon has uncertain generic and subtribal placement. The options are to accommodate it in a new genus or to place it in an existing genus in which it does not sit comfortably. Opinions as to its placement are divided evenly among the eight orchid specialists who have read drafts of this paper. Although a judgement on its taxonomic placement is hindered by its unusual sexual elements and the taxonomic and nomenclatural confusion that exists within the tribe Orchideae, its local abundance and relative uniformity shows that it is an extremely interesting taxon worthy of recognition and further study. Because I cannot reconcile the general habit of the plant and its unusual floral morphology with any known genus, I have decided to recognize it as a new genus.

Materials and methods

This study is based on the examination of fresh flowers and spirit-preserved specimens collected from localities in north-eastern Queensland. Herbarium collections were examined from AD, CANB, MEL, NSW and QRS. Measurements given in the description are from living plants. Habitat details were supplied by Lewis Roberts. Samples of fresh flowers were examined in a Cambridge Instruments S360 scanning electron microscope using an Oxford CT1500 Cryo Preparation System with the sample maintained at -18°C throughout the viewing operation.

Taxonomy

Cooktownia D.L. Jones, gen. nov.

Herbae tuberosae terrestres. Tubera elongata, radicibus similia. Folia 2, basalia, longitudine latitudinem fere aequanti, prostrata, ad basin arcte imbricata. Scapus gracilis, filo metallico similis. Bracteae steriles et fertiles arcte vaginantes. Ovarium cylindricum, attenuatum. Flores virides atro-striatae, non vel tarde aperientes. Sepalum dorsale anguste ovato-ellipticum, ad apicem cymbiforme, marginibus incrassatis. Sepala lateralalia ovato-lanceolata, ad apicem cymbiformia. Petala ovato-lanceolata, marginibus pallidis. Labellum anguste obovatum, integrum, sine calcar. Organa sexualia abortiva, atro-viridia. Anthera discreta, sine polliniis. Stigmata discreta. Capsulae anguste ovoideae, rectae.

Typus: *Cooktownia robertsii* D.L. Jones

Tuberous terrestrial herb. Tubers elongate, root-like. Leaves 2, basal, nearly as broad as long, prostrate, the bases closely imbricate. Scape slender, wiry. Sterile bracts closely sheathing. Fertile bracts closely sheathing. Ovary cylindrical, apex attenuate. Flowers green with darker lines, remaining closed or opening tardily. Dorsal sepal narrowly ovate-elliptical, margins thickened, apex cymbiform. Lateral sepals ovate-lanceolate, apex cymbiform. Petals ovate-lanceolate, margins pale. Labellum narrowly obovate, entire; spur absent. Sexual organs abortive, dark green. Anthers free, lacking pollen. Stigmas free. Capsules narrowly ovoid, erect.

The new genus belongs in the subfamily Orchidoideae, tribe Orchideae, but its subtribal placement is uncertain. Only one species is known.

Etymology: The generic name is derived from the nearest main population centre, the historic town of Cooktown which was settled near where Captain James Cook had earlier effected repairs to the barque Endeavour after it struck the coral of the Great Barrier Reef in June 1770.

Cooktownia robertsii D.L. Jones, **species nova**, *Platanthera papuanae* Schltr. affinis, a qua foliis basalibus arcte subimbricatis orbicularibus, floribus apomictibus, labello calcar carente, et columna abnormali staminodiis et stigmatibus discreto differt. **Typus:** Australia. Queensland. COOK DISTRICT: c. 3 km north of Mt Misery, 1 April 1993, C.H. Broers 441 & L.J. Roberts (holo: CANB; iso CANB, BRI, NSW, MEL).

Tuberous terrestrial herb. Tubers elongate, 4–6 cm x 6–8 mm, root-like. Leaves 2, ovate to broadly ovate-orbicular, 1.3–3 cm x 0.8–3 cm, basal, ground-hugging, the bases closely imbricate, dark green, entire, acute to subacute. Scape 15–26 cm tall, slender, wiry. Sterile bracts 3, 9–15 mm x 3–3.5 mm, lanceolate, closely sheathing. Fertile bracts ovate to ovate-lanceolate, closely sheathing. Ovary 12–15 mm x 2–3 mm, apex, attenuate. Flowers 3–9, green with darker lines, c. 7.5 mm long, remaining closed or the perianth segments spreading tardily. Dorsal sepal narrowly ovate-elliptical, 6–7 mm x c. 2.5 mm, margins thickened, apex cymbiform. Lateral sepals ovate-lanceolate, 6–7.5 mm x c. 2.5 mm, apex cymbiform. Petals 6–7 mm x c. 2.3 mm, ovate-lanceolate, margins pale greenish white. Labellum narrowly obovate when flattened, 7–7.5 mm x c. 2.5 mm, not 3-lobed, margins incurved, apex obtuse to cymbiform; spur absent. Sexual organs incompletely united and not forming a column, dark green. Anthers abortive, remaining free, lacking pollen. Stigmas abortive, longer than wide, remaining free. Capsules narrowly ovoid to narrowly obovoid, 18–22 mm x 3.5–4 mm, erect, apex drawn out. Figs. 3 & 4.

Flowering Period: March to May.

Distribution and habitat: *Cooktownia robertsii* is endemic to northeastern Queensland, Australia, where apparently it is restricted to areas south of Cooktown, between Helenvale and Mt. Poverty and North Mt. Sampson. It grows in small to large colonies amongst grass in open forest at low to moderate elevations (300–500 m.). The plants grow mostly on ridges and slopes, sometimes on very steep hillsides and also at the heads of gullies. The soil is a red stony or gravelly loam derived from decomposed slate.

Affinities: The anomalous floral morphology of *Cooktownia robertsii* makes it difficult to determine its affinities. Often such an anomalous species is spawned from an equivalent, normally reproducing taxon, but no such relationship is apparent here. The genera *Habenaria* and *Peristylus*, both members of the Habenariinae, are recorded from Australia (Clements 1989, Dockrill 1992) but none of these species are even remotely similar to the new taxon. Geographically the closest member of the Orchidinae is *Platanthera papuana* Schltr. from Papua New Guinea (Schlechter 1911–14). This species is readily distinguished from *Cooktownia robertsii* by its single erect petiolate leaf, a ligulate labellum with a basal spur and a normally functioning column.

Population size: *Cooktownia robertsii* has a narrow distributional range over about 12 km between the coordinates 15°45'S, 145°12'E on the northern side of its range and 15°55'S, 145°13'E on the southern side. It occurs in sporadic populations consisting of individuals of mixed ages and is frequently locally abundant. Juvenile plants are common. The population size is estimated to be 10,000–15,000 plants.

Reproductive biology: The population size, mixed age within populations and local abundance all show that *C. robertsii* is vigorous and reproducing freely. Examination of the root system shows clearly that vegetative reproduction does not occur in this species and it is spread entirely by the seed-like structures which are released from the capsules. These apparently germinate freely in the wild (L. Roberts pers. comm.), and at least one juvenile has now been successfully raised

from plants cultivated in the collection of the Australian National Botanic Gardens by sprinkling the seed-like structures around the base of mature plants.

Developmental embryology: The embryological development of *C. robertsii* was studied by Mark Clements as part of his Ph.D. thesis (Clements 1995), and I am grateful for his input into this section of the paper. The absence of functional pollen and stigmas in this species points to its reproduction being via apomixis. The seed-like structures have the appearance of a normal orchid seed with the embryo being rounded and surrounded by typical clathrate wings. The embryos are uniform in all of the samples studied and are completely different from the type of embryos usually seen in the seeds of other apomictic orchids. In these species, as exemplified by *Caleana minor* R. Br. and *Genoplesium apostasioides* (Fitzg.) D.L. Jones & M.A. Clem., the embryos are notable for their irregular shapes and asymmetric development.

Pollen tubes are absent from the developmental phases of *C. robertsii* and consequently there is no penetration of the embryo sac and fertilisation of the egg cell by male gametes. However, despite this the developmental stages of the embryo appear normal and are consistent at all stages with those of a typical fertilised embryo of the Orchidoideae. Thus a proembryo develops that fills the embryo sac and a linear chain of four suspensor cells grows out into the inner micropyle (Fig 2.1, 2.2). In the sample range studied, which represents many hundreds of individuals from a number of parent plants, the embryos were all uniform and no freaks or multiple embryos were seen. This clearly indicates that *C. robertsii* has successfully developed a very effective and unusual system of apomictic reproduction. In this species apomixis arises from the egg cell itself within the embryo sac. Further studies are needed to clarify the mechanism involved in this form of apomixis.

Notes: Apart from collections associated with this study no specimens of *C. robertsii* exist in any Australian herbaria.

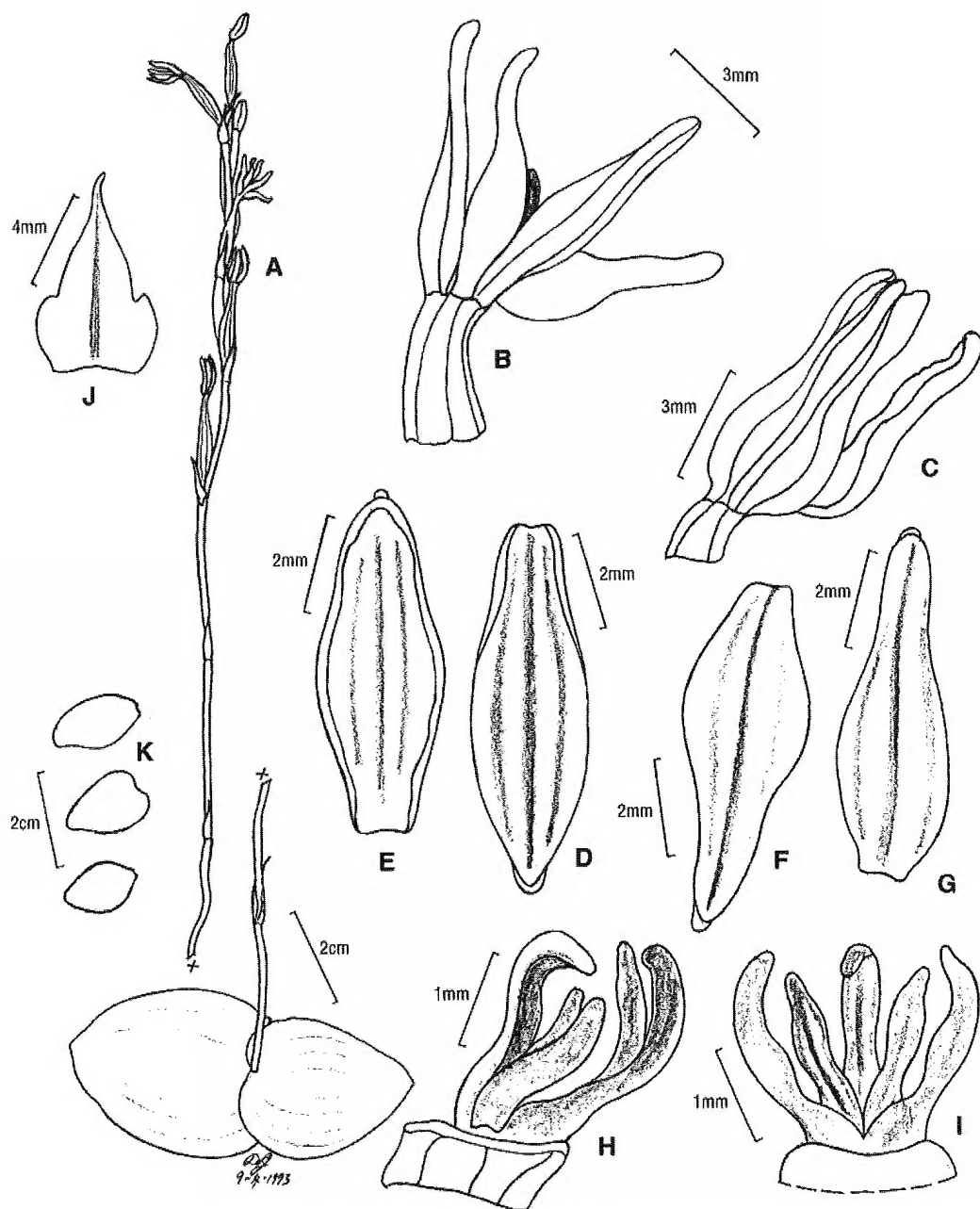


Fig. 3. *Cooktownia robertsii*. a. plant; b. & c. flowers from side; d. labellum from above; e. dorsal sepal; f. lateral sepal; g. petal; h. column from side; i. column from front; j. fertile bract. All from *Broers 441 & Roberts*.

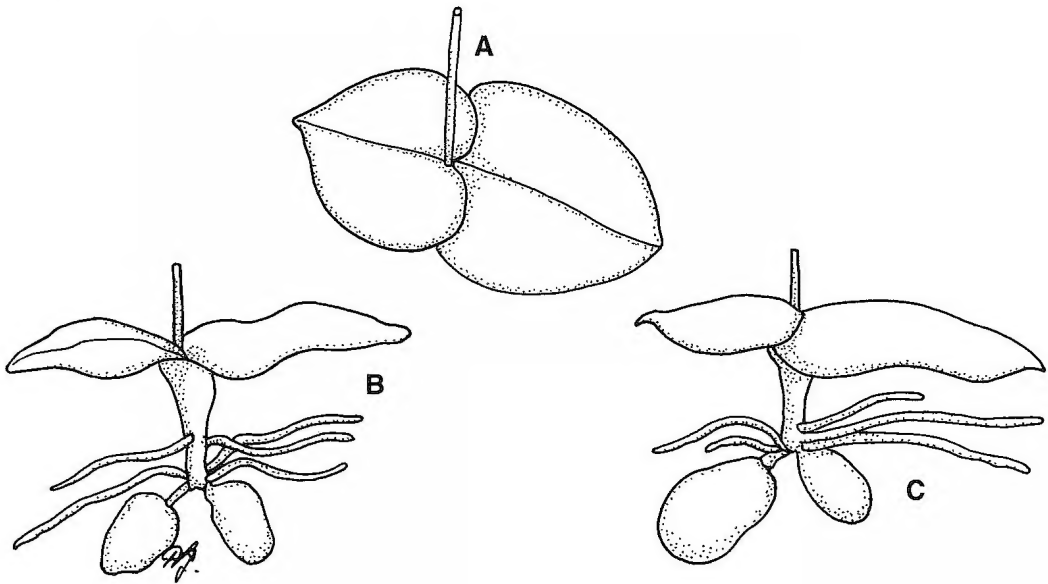


Fig. 4. *Cooktownia robertsii*. a. plant from above showing leaves; b. & c. plants from side showing root system. All from L. Roberts (ORG 710).

Additional collection: Stony Ck, 27 Apr 1997, Roberts (ORG 710) (CANB).

Conservation status: Although locally common, *Cooktownia robertsii* is restricted to a relatively small area and is not conserved; I suggest a classification 2R by the criteria of Briggs & Leigh (1996).

Etymology: The specific name honors Lewis J. Roberts who discovered the species and recognised its orchidaceous features; he has many notable natural history discoveries, including other new orchids, to his credit.

Acknowledgements

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Peter Lavarack, Peter Linder and two unknown American referees for commenting on various drafts of the manuscript. I am grateful to Roger Heady for technical assistance on the scanning electron microscope. The directors of AD, CANB, MEL, NSW and QRS are thanked for allowing me access to their collections.

References

- ABE, K. (1972). Contributions to the embryology of the family Orchidaceae VI. Development of the embryo sac in fifteen species of orchids. *Sci. Rep. Tohoku Univ.* 36: 135–178.
- AMES, O. (1910). *Orchidaceae. Fascicle IV: The genus Habenaria in North America*. 1979 reprint Stanfordville, New York. E.M. Coleman.
- BRIGGS, J.D. & LEIGH J.H. (1996). Rare or Threatened Australian Plants, Revised Edition. *CSIRO and Australian Nature Conservation Agency*.
- CATLING, P.M. & SHEVIK, C.J. (1993). Taxonomic notes on some North American orchids, *Lindleyana* 8(2): 77–81.
- CLEMENTS, M.A. (1989). Catalogue of Australian Orchidaceae. *Austral. Orch. Res.* 1: 1–160.
- (1995). *Reproductive biology in relation to phylogeny of the Orchidaceae especially the tribe Diurideae*, Doctor of Philosophy Thesis, Australian National University, Canberra.

- DOCKRILL, A.W. (1992). *Australian Indigenous Orchids*. Vol. 1. Chipping Norton: Surrey Beatty & Sons.
- DRESSLER, R.L. (1993). *Phylogeny and Classification of the Orchid Family*. Portland, Oregon: Dioscorides Press.
- FREDRIKSON, M. (1991). An embryological study of *Platanthera bifolia* (Orchidaceae). *Pl. Syst. Evol.* 174: 213–220.
- INOUE, K. (1983). Systematics of the genus *Platanthera* (Orchidaceae) in Japan and adjacent regions with special reference to pollination. *J. Fac. Sci. Univ. Tokyo* 13: 285–374.
- KURZWEIL, H. (1987). Developmental studies in orchid flowers II: Orchidoid species. *Nord. J. Bot.* 7: 443–451.
- KURZWEIL, H. & WEBER, A. (1991). Floral morphology of southern African Orchideae. I. Orchidinae. *Nord. J. Bot.* 11: 155–178.
- LINDER, H. P. & G. WILLIAMSON (1986). Notes on the orchids of southern Tropical Africa, 2. *Oligophyton drummondii*, gen. et sp. nov. *Kew Bull.* 41(2): 313–7.
- LUER, C.A. (1972). *The Native Orchids of Florida*, New York: New York Botanical Garden.
- (1975). *The Native Orchids of the United States and Canada excluding Florida*. New York: New York Botanical Garden.
- OGURA, Y. (1953). Anatomy and morphology of the subterranean organs in some Orchidaceae. *J. Fac. Sci. Univ. Tokyo* 6(4): 135–157.
- RICHARD, L.C.M. (1818). De Orchideis Europeis Annotationes. *Mem. Mus. Hist. Nat.* 4: 4248, 49, 57.
- SCHLECHTER, R. (1911–14). Die Orchidaceen von Deutsch-Neu-Guinea, *Repert. Spec. Nov. Regni Veg., Beih.* 1: 1–1079; english translation by R.S.Rogers, H.J.Katz & J.T.Simmons (1982). Melbourne: The Australian Orchid Foundation.
- SEIDENFADEN, G. (1977). Orchid Genera in Thailand V, Orchidoideae. *Dansk Bot. Arkiv* 31(3): 1–150.
- SENGHAS, K. (1973). Unterfamilie: Orchidoideae. Pages 195–215 in F.G. Brieger, R. Maatsch & K. Senghas, [eds], R. Schlechter, *Die Orchideen*. 3rd Ed. Berlin: Paul Parey.
- YOKOTA, M. (1990). Karyomorphological studies in *Habenaria*, Orchidaceae, and allied genera from Japan, *J. Sci. Hiroshima Univ.* 23: 53–161.

A taxonomic revision of the genus *Austroteenisia* R.Geesink (Fabaceae: Millettieae).

D.J. Dixon

Summary

Dixon, D.J. (1997). A taxonomic revision of the genus *Austroteenisia* R.Geesink (Fabaceae: Millettieae). *Austrobaileya* 5(1): 79–91. The genus *Austroteenisia* R.Geesink is revised. Four species are recognized, namely *Austroteenisia blackii* (F.Muell.) R.Geesink, *A. stipularis* (C.T. White) Jessup, *A. glabristyla* Jessup and *A. mollitricha*. Two varieties are recognized within *A. blackii* namely *A. blackii* (F.Muell.) R.Geesink var. *blackii* and *A. blackii* var. *astipella* D.J.Dixon. All taxa are described in detail and a key to their identity is provided.

Keywords: Fabaceae, Millettieae, *Austroteenisia*, *Austroteenisia blackii* var. *blackii*, *Austroteenisia blackii* var. *astipella*, *Austroteenisia glabristyla*, *Austroteenisia mollitricha*, *Austroteenisia stipularis*.

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Introduction

Austroteenisia R.Geesink, a member of the tribe Millettieae in the family Fabaceae, was first described in 1984 although *A. blackii* (F.Muell.) R.Geesink (*Millettia blackii* F.Muell.) and *A. stipularis* (C.T. White) Jessup (*Lonchocarpus stipularis* C.T. White) were described much earlier. Mueller (1861) described *M. blackii* based on material collected from the Clarence River, Hastings River and Moreton Bay areas. Benthham (1864) transferred *M. blackii* to *Lonchocarpus* Kunth. A new taxon, *L. nesioties*, was described by Bailey (1906) based on two specimens collected from the Bloomfield River and Percy Islands. The Bloomfield River specimen was subsequently selected as lectotype for Bailey's name which was transferred to *Derris* Lour. by Domin (1926). During a survey of the Australian species of *Derris*, *Tephrosia* Pers., and *Lonchocarpus*, White (1929) found the material used by Bailey as syntypes of his name consisted of fragments of *Derris trifoliata* var. *macrocarpa* Domin and *A. blackii*. White pointed out that the specimen chosen by Domin

as lectotype of Bailey's name was also a mixed collection and that while the pods belonged to a species of *Derris* the leaves and flowers belonged to *Lonchocarpus blackii*. He thereby restricted the lectotype of Bailey's name to the pods in Poland's Bloomfield River specimen. White (1933) described *L. stipularis*. Polhill (1971) transferred the Australian species of *Lonchocarpus* to *Kunstleria* Prain, stating that only a slightly broadened generic concept was needed for their inclusion in this genus. Geesink (1984), in discussing his concept of *Kunstleria*, found that the Australian species differed from the Malesian and Philippine species, hence the circumscription of *Austroteenisia* and the new combination, *A. blackii*, which was made at that time. Jessup (1986) made the second combination when transferring *Kunstleria stipularis* to *Austroteenisia*, and at the same time described a new species, *A. glabristyla*.

Despite the studies of Geesink (1984), *Austroteenisia* has never been critically revised in its entirety, and problems remain within the group. For example, Jessup (1986) considered that imperfect material present in the Queensland Herbarium represents further taxa in the genus. These specimens were not seen

by Geesink. Therefore the research reported here aimed to critically review the genus and to assess the status of these specimens.

Materials and Methods

This study was based on herbarium specimens in BRI, LAE, MEL, NSW and QRS. Field observations of all species except *A. glabristyla* were made by the author.

Taxonomy

Geesink (1984) based his concept of *Austroteenisia* on the known species *A. blackii* and *Kunstleria stipularis*. However, to account for the species described by Jessup (1986) and the new taxa identified here, Geesink's concept needs to be slightly modified. To account for the new taxa, the leaflet number, flower length, ovule number and number of seeds per pod have been amended in the generic description, (Table 1). Axillary panicles are also recorded

in the genus for the first time. The following generic description is thus based partly on the description of *Austroteenisia* sensu Geesink (1984) and partly on the results of this research. A key to the genera of the Millettieae has already been provided by Geesink (1984).

Austroteenisia R.Geesink, *Scala Millettiearum* 78 (1984) **Type:** *A. blackii* (F.Muell.) R.Geesink

Lianas. Leaves compound, alternate; leaflets 5–17; stipellae present or absent. Inflorescence a terminal or axillary panicle. Bracts shorter than the corresponding flower buds; bracteoles present. Flowers 7.5–10.5 mm long; hypanthium indistinct. Calyx imbricate with 5 subequal lobes. Standard blade $\pm$ orbicular, strongly reflexed at base; basal callosities absent; wings with a normal claw and strongly reduced blade; keel petals falcate. Staminal tube straight; upper filament adnate to the other filaments. Basal fenestrae distinct. Disk distinct. Ovary hairy; ovules 9–20. Pod indehiscent, flat, membranous, without wings. Seeds 1–8, reniform, laterally flattened; radicle folded.

Table 1. The character states as accepted here in *Austroteenisia*, compared with those given by Geesink (1984).

Character	Geesink (1984)	Dixon (1997)
Leaflet number	7–17	5–17
Flower length	c. 10mm long	7.5–10.5mm long
Ovule number	14–17	(7) 9–20
Seeds per pod	4–7	1–8
Panicle	terminal	terminal & axillary

Key to the species of *Austrosteenisia*

1. Leaflets 9–17; flowers either pink and white or mauve and white. 2
 Leaflets 5–11; flowers maroon-red. 3
2. Stipellae present; flowers mauve and white; style glabrous or nearly so;
 distribution south-eastern Queensland and north eastern New South
 Wales between latitudes 26°30'S and 30°20'S **4. A. glabristyla**
 Stipellae absent; flowers pink and white; style bearded along upper margin
 with golden hairs; distribution in rainforests of north-eastern Queensland
 between latitudes 15°50'S and 17°30'S **1. A. stipularis**
3. Abaxial leaflet surface pilose; staminal tube with erect $\pm$ appressed hairs;
 distribution north of latitude 14°S along the east coast of Cape York
 Peninsula **3. A. mollitricha**
 Abaxial leaflet surface glabrous or with erect or appressed antrorse hairs,
 rarely pilose; staminal tube glabrous rarely with hairs; distribution south
 of latitude 15°26'S extending along the Queensland and New South
 Wales coast to latitude 32°24'S **2. A. blackii**

1. ***Austrosteenisia stipularis*** (C.T.White)
 Jessup, *Austrobaileya* 2(3): 243–245
 (1986); *Lonchocarpus stipularis*
 C.T.White, Contr. Arnold Arb. Harvard
 Univ. 4: 45–46 (1933); *Kunstleria*
stipularis (C.T.White) Polhill, Kew Bull.
 25(2): 265 (1971). **Type:** Queensland.
 COOK DISTRICT: Lake Barrine, Atherton
 Tableland, 8 November 1929,
S.F.Kajewski 1348 (holo: BRI).

Robust liana. Stems covered with dense hyaline to rusty brown appressed hairs, glabrescent; lenticels elliptic, longitudinal. Leaves 5.5–27.0 cm long; stipules peltate, subrotund, 3.5–6.4 mm long, 2.3–4.5 mm wide, ciliate, caducous; stipellae absent. Leaflets 9–15, opposite, subopposite or occasionally alternate, imparipinnate, petiolules 0.6–7.0 mm long; laminae elliptic, oblong, or obovate, 0.9–7.2 cm long, 0.4–2.5 cm wide, increasing in size distally; base obtuse, cuneate, narrowly cuneate or attenuate; apex rounded, obtuse, acute, or acuminate with a small mucro; secondary veins 4–8 pairs with vein angle 32°–73°; adaxial leaflet surface with $\pm$ appressed antrorse or erect, hyaline to light brown hairs, glabrescent; abaxial surface pilose with erect hyaline to light brown hairs. Inflorescence a panicle to

38 cm long. Pedicels 0.5–3.6 mm long; calyx 4.3–5.8 mm long; petals pink and white; standard circular or widely to very widely ovate, 7.5–10.5 mm long including claw, c. 8.0 mm wide; wings 3.5–5.6 mm long; keel 7.0–9.6 mm long. Staminal tube glabrous. Ovary densely villous; ovules 6–14. Style bearded with golden hairs along upper margin. Pod elliptic to oblong, 4.7–9.0 cm long, 1.8–2.1 cm wide, with long and short golden brown appressed and erect hairs; stipe 4.5–10.0 mm long. Seeds 1–6. Fig. 1.

Selected examined specimens : Queensland. COOK DISTRICT: 18 miles N of Mossman, Nov 1967, *Boyland & Gillieatt* 389 (BRI); Fairyland, Jan 1940, *Flecker* 6536 (QRS); 5 miles the Mareeba side of Kuranda, Oct 1976, *Gray* 203 (QRS); Forestry Reserve 1073, near Kuranda, Oct 1962, *Hyland* AFO/2793 (BRI); Lake Barrine, Nov 1971, *Hyland* 5637 (QRS); Egan Creek logging area, SW corner, Nov 1958, *Smith* 10486 (BRI); Canal Creek near Waugh's Pocket N of Innisfail, Oct 1973, *Webb & Tracey* 13653 (QRS); Lake Barrine, Atherton Tableland, Nov 1929, *White* 1348 (BRI); Kuranda, Nov 1985, *Williams* 85322 (BRI).

Etymology: The species epithet refers to the presence of stipules.

Distribution and habitat: *A. stipularis* is restricted to the 'Wet Tropics' rainforests of north-eastern Queensland between latitudes 15°50'S and 17°30'S, (Map 1). Personal

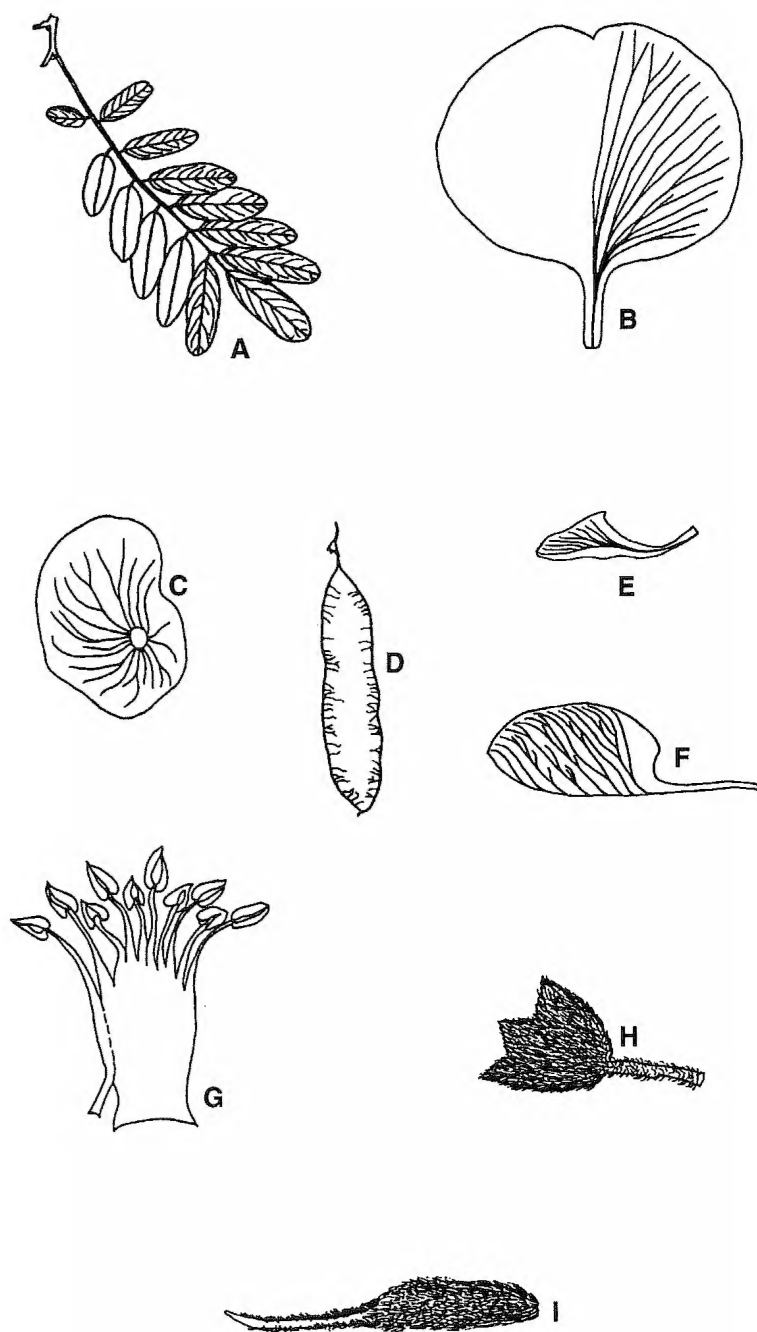
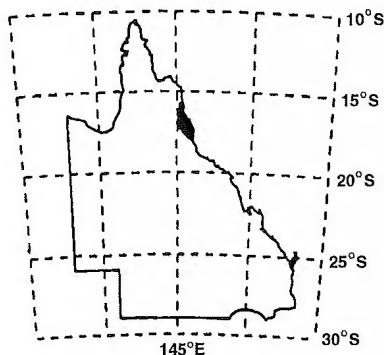


Fig. 1. *Austrosteenisia stipularis*. A. leaf $\times 0.4$. B. standard $\times 4$. C. stipule $\times 4$. D. pod $\times 0.4$. E. wing $\times 4$. F. keel $\times 4$. G. staminal tube $\times 4$. H. calyx $\times 4$. I. gynoecium $\times 4$. A from Hyland 5637 (QRS); B–E, H & I from Dixon MB10/1994 (JCU); F from Flecker 6536 (QRS). Del. D.J.Dixon.

observations indicate that it is commonly encountered throughout its distributional range. Complex mesophyll vineforests are recorded as its preferred habitat (Hansen and Sankowsky, 1992). It has been found growing on a variety of soil types such as alluvial, basaltic, granitic and soils derived from metamorphic rock (Hansen and Sankowsky, 1992).

Phenology: *A. stipularis* is a deciduous species. Flowering occurs either before or with the new flush of leaves (Williams 1984). This species flowers between the months of September and November. Fruits have been recorded in January.



Map 1. Distribution of *Austrosteenisia stipularis*.

2. ***Austrosteenisia blackii*** (F.Muell.) R.Geesink, *Scala Millettiearum* (1984); *Millettia blackii* F.Muell., *Fragmenta Phytographiae Australiae*, 2:123 (1861); *Lonchocarpus blackii* (F.Muell.) Benth., *Flora Australiensis*, 2:271-272 (1864); *Kunstleria blackii* (F.Muell.) Polhill, *Kew Bull.* 25(2):259-273 (1971). **Type:** Moreton Bay, *W.Hill* (syn: n.v.); Hastings River, *H.Beckler* (syn: MEL); Clarence River, *H.Beckler* (syn: n.v.).

[*Lonchocarpus nesiotes* sensu F.M.Bailey, *Queensland Agric. J.*, 17:162 (1906), pro parte, fide Polhill loc. cit.]

Woody liana. Stems covered with dense hyaline to rusty-brown erect to curved and appressed hairs, glabrescent; lenticels elliptic to rounded, longitudinal. Leaves 5.5–26 cm long; stipules peltate, lanceolate, ovate, 8.0–12 mm long, 3.5–5.0 mm wide, caducous; base rounded; apex acuminate; margin ciliate; stipellae present, 0.8–3.3 mm long, or absent. Leaflets 5–11, opposite or subopposite, imparipinnate; petiolules 1.6–6.7 mm long; laminae narrowly elliptic, elliptic to oblong, ovate or obovate, 1.4–11.8 cm long, 0.7–5.9 cm wide, increasing in size distally; base oblique, obtuse, truncate, or cuneate; apex acute, acuminate, or caudate with a small mucro; secondary veins 4–11 pairs with vein angle 38°–73°; adaxial leaflet surface glabrous or glabrescent; midvein with hyaline to rusty-brown, erect or curved hairs extending on to the laterals; abaxial surface with appressed antrorse, erect, hyaline hairs, glabrescent, very rarely pilose. Inflorescence a panicle to 34 cm long. Pedicels 1.0–4.5 mm long; calyx 4.0–7.0 mm long; petals maroon-red; standard circular, broadly to very broadly ovate, or depressed ovate to broadly depressed ovate, 7.5–10.5 mm long including claw, 5.2–9.5 mm wide; wings 3.5–6.0 mm long; keel 7.0–9.8 mm long. Staminal tube glabrous, rarely with hyaline hairs. Ovary densely villous with golden brown hairs; ovules mostly 10–20, very rarely as few as 7. Style bearded with golden brown hairs along upper margin. Pod elliptic to oblong, 3.8–9.6 cm long, 0.9–2.0 cm wide with appressed short and erect long hyaline and golden brown hairs; stipe 3.0–10.0 mm long. Seeds 1–8, reniform.

Etymology: This species was named after the most renowned Alan Black, custodian of Hooker's Herbarium and who first placed this species in the genus *Millettia* (Mueller 1861).

Two varieties are distinguished as follows.

- | | |
|--|-----------------------|
| 1. Leaves with stipellae present | var. blackii |
| Leaves with stipellae absent | var. astipella |

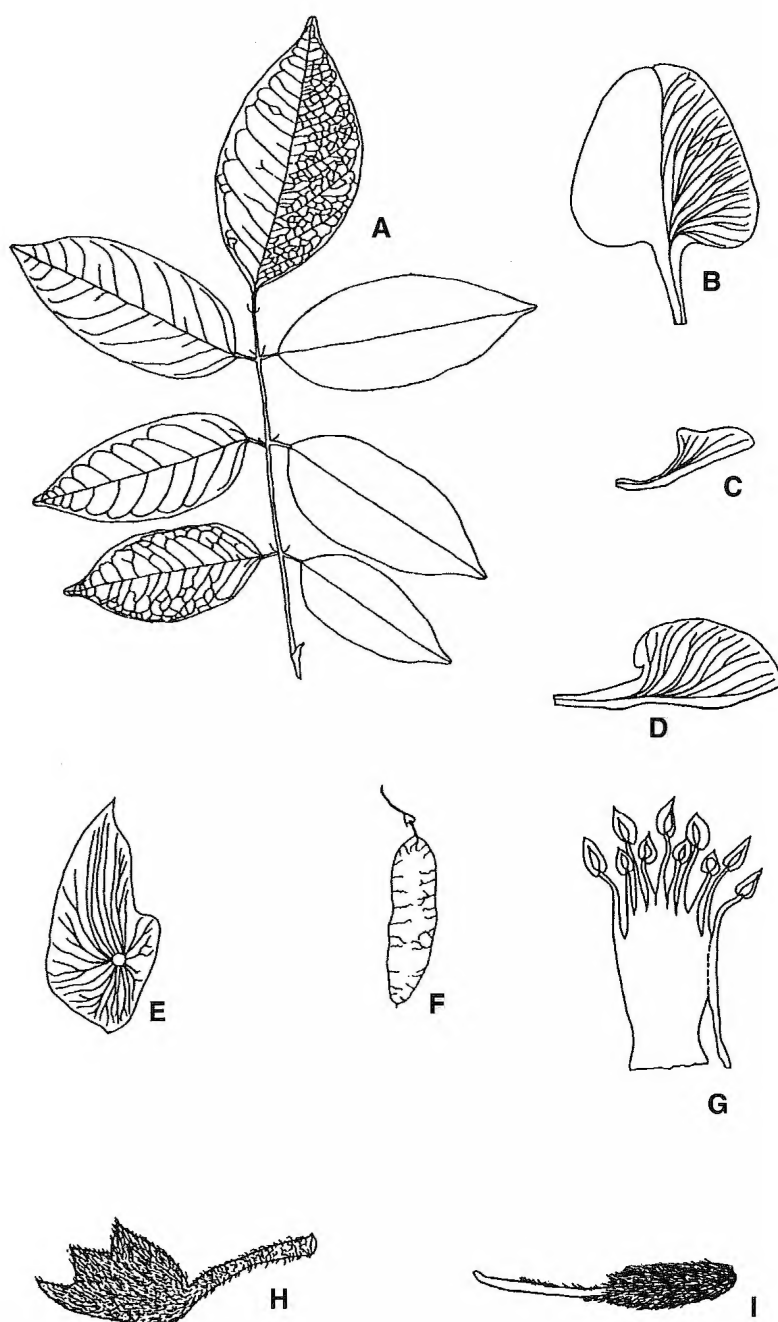


Fig. 2. *Austrosteenisia blackii* var. *blackii*. A. leaf. $\times 0.4$. B. standard $\times 4$. C. wing $\times 4$. D. keel $\times 4$. E. stipule $\times 4$. F. pod $\times 0.4$. G. staminal tube $\times 4$. H. calyx $\times 4$. I. gynoecium $\times 4$. A from McDonald 4511 et al. (BRI); B–D, G–I from Dixon CA10/1994 (JCU); E from Forster PIF7676 (BRI); F from MEL 725121 (MEL). Del. D.J.Dixon.

Austrosteenisia blackii* var. *blackii

Distinguished by stipellae present on leaves. Fig. 2.

Selected examined specimens: Queensland. COOK DISTRICT: Prior Creek, Atherton, Dec 1938, *Flecker* s.n. (QRS); S.F.R. 185, Jan 1980, *Gray* 1617 (QRS); Tolga, Jan 1981, *Gray* 1878 (QRS). NORTH KENNEDY DISTRICT: 5 km NW of Cardwell, on S bank of Meunga Creek, Oct 1976, *Everist* s.n. (BRI); PORT CURTIS DISTRICT: West Bay, Middle Percy Island, Nov 1989, *Batianoff* 11823, *Champion*, *Thompson & Dillewaard* (BRI); near Carmilla, Oct 1937, *White* 12101 (BRI). BURNETT DISTRICT: Kalliwa S.F. 169, Dec 1990, *Forster* PIF7713 (BRI). WIDE BAY DISTRICT: Ocean Park Estate, Dundowran, Nov 1991, *Forster* PIF9182 (BRI). MORETON DISTRICT: Petrie, N of Brisbane, Nov 1931, *Blake*, 2842 (BRI); Fig Tree Pocket, Brisbane, Jan 1978, *Pedley* 5005 (BRI); Mt. Crosby Road, Barnes Hill, Nov 1993, *Grimshaw* G94 (BRI). New South Wales. Lismore, *Fawcett* s.n. (MEL); Richmond River, *Fawcett* s.n. (MEL); Upper Hastings River, Nov 1897, *Maiden* s.n. (NSW); Ballina, Dec 1895, *Bauerlen* s.n. (NSW); Tooloom Range, Dec 1907, *Maiden* s.n. (NSW).

Austrosteenisia blackii* var. *astipella

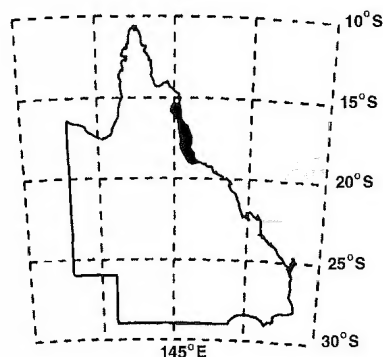
D.J.Dixon var. nov. ab *A. blackii* var. *blackii* differt stipellis absentibus. **Type:** Queensland. COOK DISTRICT: S.F.R. 185 opposite fire tower, 17°09'S 145°31'E, 31 October 1978, *J.D. Fitzsimon* 296, (holo: QRS). Fig. 3.

Selected examined specimens: Queensland. COOK DISTRICT: S.F.R. 185, Oct 1978, *Fitzsimon* 296 (QRS); Mazlin Creek, Atherton, Nov 1991, *Le Cussan* 11 (QRS); 7 km NNW of Lakeland Downs, Cape York, Sep 1987, *Orr* 197 (DNA); Clohesy River, Oct 1984, *Sankowsky* 354 & *Sankowsky* (BRI); Yungaburra, Nov 1985, *Sankowsky* 451 & *Sankowsky* (BRI). NORTH KENNEDY DISTRICT: west of Kennedy, near Cardwell, Sep 1935, *Blake* 9721 (BRI).

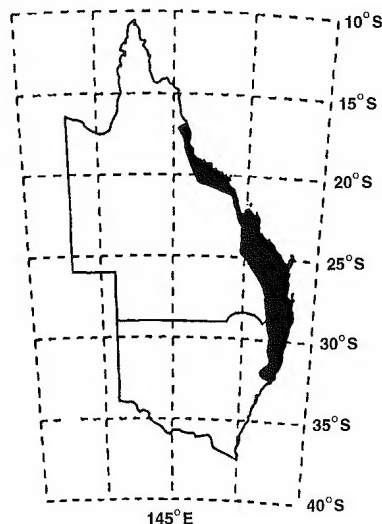
Etymology: The varietal epithet refers to the absence of stipellae.

Distribution and habitat: *A. blackii* is distributed along the east coast of Australia from latitude 15°26'S to 32°24'S. *A. blackii* var. *astipella* occurs between latitudes 15°26'S and 19°S (Map 2), and is sympatric for part of its range with the type variety which occurs between latitudes 16°55'S and 32°24'S, (Map 3). Both varieties of *A. blackii* are strong vigorous conspicuous lianas common throughout their respective distributional ranges. *A. blackii* is considered well preserved (Forster et al., 1991). Rainforest classified as

simple notophyll evergreen vineforest, complex mesophyll vineforest (Hansen and Sankowsky, 1992), semi-evergreen vine thickets, araucarian microphyll vineforest, and complex notophyll vineforest are the main habitats recorded for this species (Forster et al., 1991). It does however, extend out of the rainforest wherever ample moisture prevails, being quite common on creek and river banks of coastal Queensland (Williams, 1979). This species is commonly referred to as blood vine because of the red exudate that oozes from wounded tissue.



Map 2. Distribution of *Austrosteenisia blackii* var. *astipella*.



Map 3. Distribution of *Austrosteenisia blackii* var. *blackii*.

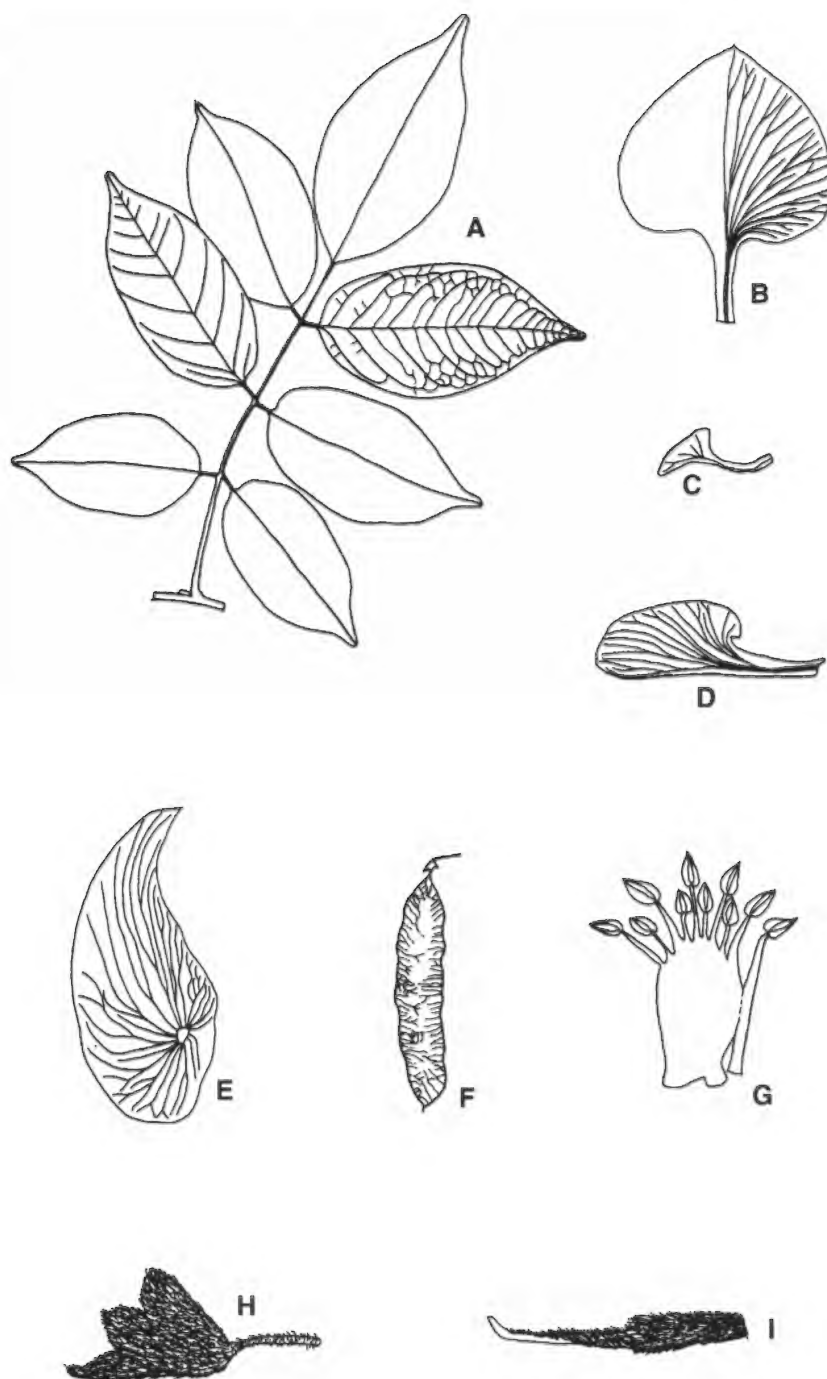


Fig. 3. *Austrosteenisia blackii* var. *astipella*. A. leaf $\times 0.4$. B. standard $\times 4$. C. wing $\times 4$. D. keel $\times 4$. E. stipule $\times 4$. F. pod $\times 0.4$. G. staminal tube $\times 4$. H. calyx $\times 4$. I. gynoeceum $\times 4$. A–D, G–I from Fitzsimon 296 (QRS); E from Poland 27 (BRI); F from Kemp (xxx). Del. D.J.Dixon.

Phenology: *A. blackii* flowers between September and December. Pods have been recorded from October to the following June.

Notes: *A. blackii* has also been recorded from Papua New Guinea (Queensland Herbarium, 1994) although I consider its recorded occurrence in PNG to be doubtful. The LAE specimen NGF48634 was annotated by a previous worker as of doubtful origin and locality. I agree with this annotation for a number of reasons. Firstly, *A. blackii* is a very conspicuous liana when in flower and in Australia is commonly encountered and collected. BRI, MEL, NSW and QRS hold substantial accessions compared to LAE which has only one. Secondly, *A. blackii*, in Australia, does not occur north of latitude 15°26'S, although there is suitable habitat north of this latitude. Thirdly, the new species *A. mollitricha*, also a commonly encountered liana which occurs north of latitude 14° S to the tip of Cape York Peninsula, has not been recorded from PNG. Therefore, the disjunct nature of the NGF48634 collection casts doubt on the occurrence of *A. blackii* in PNG. Only further field work will establish the authenticity of the PNG accession as actually coming from PNG.

3. *Austrosteenisia mollitricha* D.J.Dixon, sp. nov. affinis *A. blackii*, *A. stipulari* et *A. glabristyla*; ab *A. blackii* var. *astipella* et *A. stipulari* differt stipellis praesentibus; ab *A. blackii* differt tricomatibus pilosis in abaxiali pagina folioli praesentibus; ab *A. glabristyla* differt stylo barbato et numero foliolorum. **Type:** Queensland. COOK DISTRICT: Lockerbie Scrub, 23 September 1991, G. Sankowsky 1229 & N. Sankowsky (holo: BRI; iso: NSW, MEL).

Robust liana. Stems covered with dense hyaline to rusty brown hairs, glabrescent, glaucous, lenticels elliptic, longitudinal. Leaves 15.0–33.0 cm long; stipules, peltate, ovate, c. 14 mm long, c. 4 mm wide, ciliate, caducous; stipellae 1.3–3.5 mm long. Leaflets 5–9, mostly 7, opposite, imparipinnate; petiolules 2.1–6.7 mm long; laminae elliptic, oblong, ovate, obovate, 3.6–14.3 cm long, 1.3–6.1 cm

wide, increasing in size distally; base obtuse, rounded, oblique, cuneate, or narrowly cuneate; apex rounded, obtuse, acuminate, or caudate, with a small mucro; secondary veins 6–13 pairs with vein angle 36°–65°; adaxial leaflet surface mainly glabrous; midvein with hyaline to rusty brown hairs, some extending to the secondary veins; abaxial surface pilose with erect hyaline to rusty brown hairs. Inflorescence a panicle to 33 cm long. Pedicels 2.2–5.0 mm long; calyx 4.4–6.5 mm long; petals maroon-red; standard widely ovate, 9.0–10.5 mm long including claw, to 6.0 mm wide; wings 3.6–6.2 mm long; keel 8.5–10.0 mm long. Staminal tube with hyaline erect, ± appressed hairs. Ovary densely villous; ovules 9–13. Style bearded with hyaline to light golden brown hairs along upper margin. Pod elliptic to oblong, 5.2–10.8 cm long, 1.5–2.1 cm wide, with long and short appressed and erect golden brown hairs; stipe 4.0–7.7 mm long. Seeds 1–7, reniform. Fig. 4.

Selected examined specimens: Queensland. COOK DISTRICT: Wenlock River, Portland Roads road, Jul 1988, *Dalliston* CC125 (BRI); Pascoe River mouth, N bank, 33.8 km NNW of Lockhart River, Apr 1993, *Fell* DGF3138 & *Butcher* (BRI); escarpment of Great Dividing Range, 14.6 km NE of Heathlands Ranger Base, Oct 1993, *Fell* DGF3737 & *Stanton* (BRI); Lankelly Creek, Oct 1980, *Hyland* 10845 (QRS); Lockerbie Scrub, Sept 1991, *Sankowsky* 1229 & *Sankowsky* (BRI; NSW); Quintil Beach, N of road from Lockhart River, Nov 1977, *Tracey* 14319 (BRI); north bank of Pascoe River approx 1 km inland of river mouth, Nov 1977, *Tracey* 14387 (BRI); Lockerbie Homestead, Sep 1985, *Williams* 85189 (BRI); Goanna Creek E. of McIlwraith Range, Nov 1956, *Webb* 3159 (BRI); Bamaga, in 1962, *Webb* & *Tracey* 8019 (BRI); headwaters of Massey Creek, McIlwraith Range, Oct 1969, *Webb* & *Tracey* 9278 (BRI); Rocky River, McIlwraith Range, Oct 1969, *Webb* & *Tracey* 9368 (BRI); Rocky River on E. Foothills of McIlwraith Range, Oct 1969, *Webb* & *Tracey* 9423 (BRI); head of Peach Creek, McIlwraith Range, Oct 1969, *Webb* & *Tracey* 9868 (BRI).

Distribution and habitat: *A. mollitricha* occurs north of latitude 14°S along the east coast of Cape York Peninsula (Map 4). It is a commonly encountered canopy liana found growing in a range of forest types including semi-evergreen vineforest, semi-deciduous mesophyll vineforest, evergreen notophyll vineforest, and deciduous vine thickets. This species favours no particular soil type. It has been recorded on red lateritic soils, granitic alluvium, aeolian dune sand and sandstone.

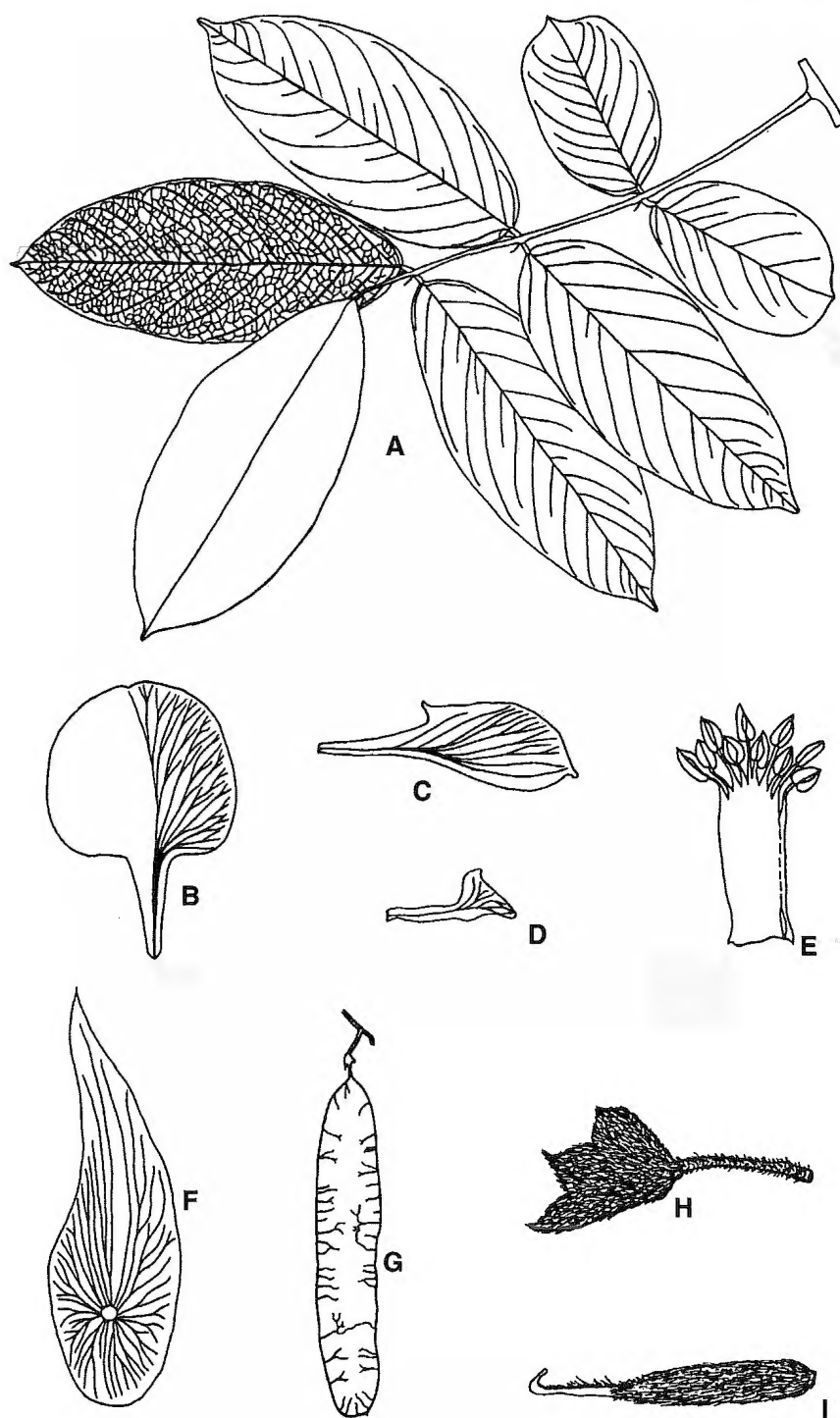
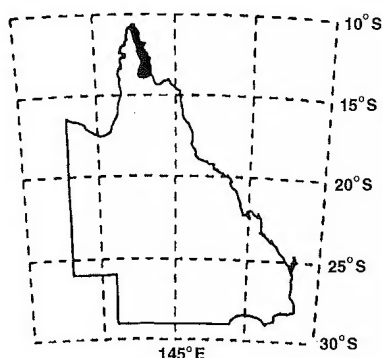


Fig. 4. *Austrosteenisia mollitricha*. A. leaf $\times 0.4$. B. standard $\times 4$. C. keel $\times 4$. D. wing $\times 4$. E. staminal tube $\times 4$, F. stipule $\times 4$. G. pod $\times 4$. H. calyx $\times 4$. I. gynoecium $\times 4$. A from Tracey 14319 (BRI); B–E, H & I from Sankowsky 1229 & Sankowsky (BRI), F from Webb & Tracey 9868 (BRI); G from Webb and Tracey 9368 (BRI). Del D.J. Dixon



Map 4. Distribution of *Austrosteenisia mollitricha*.

Phenology: *A. mollitricha* flowers from August to October with fruit sometimes persisting until the following flowering season.

Etymology: The species epithet is derived from the Latin *mollis* (soft or pliant) and *tricha* (hair), and refers to the soft hairs present on the abaxial surface of the leaflets.

Notes: *A. mollitricha* is closely related to *A. blackii*. It can be distinguished from this species by the pilose hairs on the abaxial surface of the leaflets and the presence of hairs on the staminal tube. *A. mollitricha* also possesses a unique distribution which does not overlap with that of any of the other species.

4. ***Austrosteenisia glabristyla*** Jessup, *Austrobaileya* 2(3): 243–245 (1986).
Type: Queensland, MORETON DISTRICT: Picnic Rock Track, Lamington National Park, 10 January 1984, *L.W. Jessup* 581 & *A.E. Daly* (holo: BRI; iso: BRI; CANB, K, L, MEL, MO, NE, NSW fide Jessup op. cit.).

Woody liana. Stems densely villous with golden, rusty brown erect and $\pm$ appressed hairs, glabrescent; lenticels subrotund, longitudinal. Leaves 5.0–27.5 cm long; stipules peltate, ovate, 10.0–14.0 mm long, 6.0–8.0 mm wide, ciliate, caducous; stipellae 0.9–5.0 mm. Leaflets 9–17, opposite, subopposite, or occasionally alternate, imparipinnate; petiolules 1.3–3.8 mm long; laminae elliptic, oblong, obovate, lanceolate,

or oblanceolate, 1.5–10.4 cm long, 0.4–2.9 cm wide, increasing in size distally; base obtuse, oblique, cuneate, or narrowly cuneate; apex acute or acuminate, with mucro; secondary veins 5–12 pairs with vein angle 33°–65°; adaxial leaflet surface mostly glabrous; midvein with hyaline to rusty brown erect hairs; abaxial surface pilose with $\pm$ appressed antrorse hyaline to light brown hairs. Inflorescence a panicle to 33 cm long. Pedicels 1.1–2.1 mm long; calyx 3.0–5.5 mm long; petals mauve and white; standard broadly ovate, 9.2–10.5 mm long including claw, 8.3–8.5 mm wide; wings 4.5–5.0 mm long; keel 8.6–9.7 mm long. Staminal tube glabrous. Ovary densely villous; ovules 10–16. Style glabrescent. Pod elliptic to oblong, 32.0–61.0 mm long, 13.0–16.0 mm wide with long and short appressed and erect hairs; stipe 3.5–9.5 mm long. Seeds 1–4, oblong to reniform; testa brown. (Stipules not seen; measurements taken from Jessup 1986). Fig. 5.

Selected examined specimens: Queensland, MORETON DISTRICT: Picnic Rock Track, Jan 1984, *Jessup* 581 & *Daly* (BRI; NSW); Picnic Rock Track, Apr 1984, *Jessup* 584 (BRI); Currumbin Valley, May 1985, *Jones* 1807 (BRI); near Bijungoroo Cave, W of Canungra Creek, Lamington Plateau, Jan 1966, *Whaite* 3014 (NSW). New South Wales, Dorrigo, Jan 1935, *Fraser* s.n. (NSW); between Thora and Dorrigo, Jan 1960, *Salas* 1905 (NSW); 3 km E of Mooball, beside Burringbar Creek, Nov 1977, *Williams* s.n. (BRI, NSW).

Etymology: The species epithet refers to the glabrous style.

Distribution and habitat: *A. glabristyla* occurs in coastal south-eastern Queensland and north-eastern New South Wales between latitudes 26°30'S and 30°20'S, (Map 5). In Queensland, it has been found growing in complex notophyll vineforest (Jessup 1986) and is considered adequately conserved (Forster et al. 1991). In New South Wales, it has been recorded in both rainforest and open eucalypt woodland.

Phenology: *A. glabristyla* flowers between November and January. Fruits have been recorded from April to September.

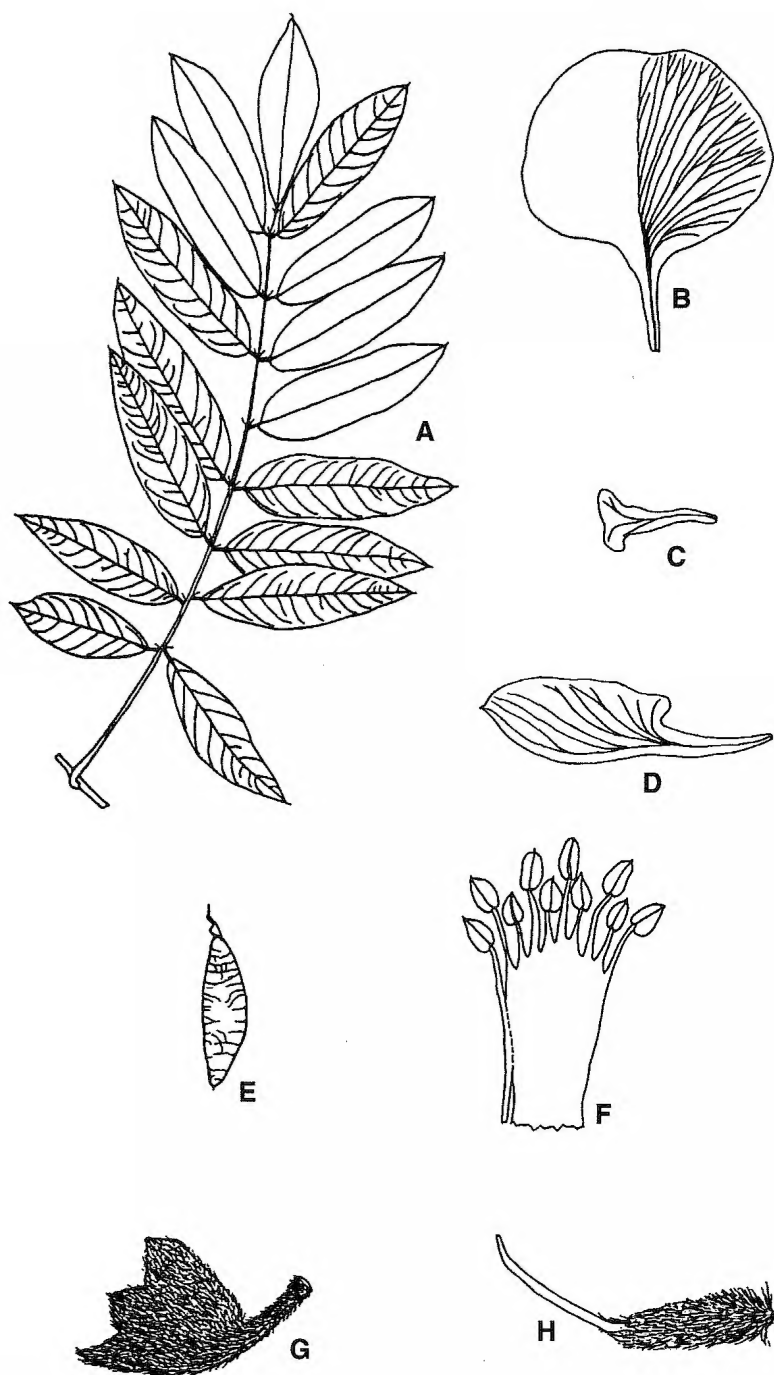
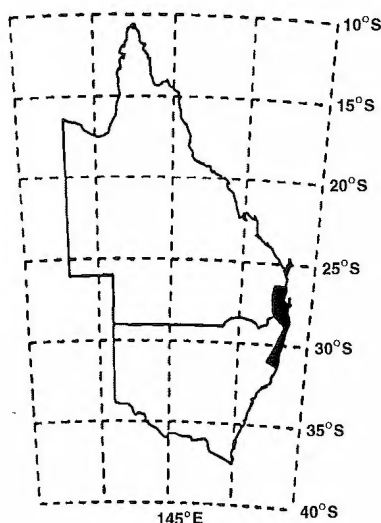


Fig. 5 *Austroteenisia glabristyla*. A. leaf $\times 0.4$. B. standard $\times 4$. C. wing $\times 4$. D. keel $\times 4$. E. pod $\times 4$. F. staminal tube $\times 4$. G. calyx $\times 4$. H. gynoecium $\times 4$. A from Jessup 192 (BRI); B–D, F–I from Williams [AQ520574] (BRI); E from Jessup 584 (BRI). Del. D.J.Dixon



Map 5. Distribution of *Austrosteenisia glabristyla*.

Acknowledgments

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References

- BAILEY, F.M. (1906). Contributions to the Flora of Queensland, *Queensland Agricultural Journal*, 17:162.
- BENTHAM, G. (1864). Leguminosae. In *Flora Australiensis* 2: London: L.Reeve & Co.
- DOMIN, K. (1926). Beitrage zur flora und pflanzengeographie Australiens 758–786, *Bibliotheca Botanica*, 89(3):230–231.
- FORSTER, P.I., BOSTOCK, P.D., BIRD, L.H. & BEAN, A.R. (1991). *Vineforest Plant Atlas for South East Queensland*. Brisbane: Queensland Herbarium.
- GEESINK, R. (1984). *Scala Millettiearum*. E. J. Brill / Leiden University Press.
- HANSEN, V. & SANKOWSKY, G. (1992). *Treedis: A Rainforest Tree Distribution Database*. Tolga: Ausplot Software.
- Henderson, R.J.F. (ed.) (1994). *Queensland Vascular Plants: Names and Distribution*. Brisbane: Queensland Department of Environment and Heritage.
- JESSUP, L.W. (1986). New combination and species in *Austrosteenisia* Geesink (Fabaceae-Millettieae). *Austrobaileya* 2(3): 243–245.
- MUELLER, F. (1861). *Fragmenta Phytographiae Australiae* 2:123–124.
- POLHILL, R.M. (1971). Some observations on generic limits in Dalbergieae-Lonchocarpaceae Benth. (Leguminosae). *Kew Bulletin* 25(2):259–273.
- WHITE, C.T. (1929). The Australian species of *Lonchocarpus* and *Derris*. *Royal Botanic Gardens Kew Bulletin of Miscellaneous Information*, 10:309–310.
- WHITE, C.T. (1933). Ligneous plants collected for the Arnold Arboretum in North Queensland by S. F. Kajewski in 1929. *Contributions from the Arnold Arboretum of Harvard University* 4:45–46.
- WILLIAMS, K.A.W. (1979). *Native Plants Queensland, Volume 1*. North Ipswich: Keith A. W. Williams.
- (1984). *Native Plants Queensland, Volume 2*. North Ipswich: Keith A. W. Williams.

***Rothia indica* subsp. *australis* A. E. Holland (Fabaceae: Crotalariaeae), a new subspecies occurring in Australia**

A.E. Holland

Summary

Holland, Ailsa. E. (1997). *Rothia indica* subsp. *australis* (Fabaceae: Crotalariaeae), a new subspecies occurring in Australia. *Austrobaileya* 5(1): 93–96. Australian material previously identified as *Rothia indica* (L.) Druce, is here described as a new subspecies *R. indica* subsp. *australis* A.E.Holland, subsp. nov. Illustrations and a key to the subspecies of *Rothia indica* are included.

Key words: Fabaceae:Crotalariaeae, *Rothia indica* subsp. *australis*.

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Introduction

Rothia Pers. is a genus of two species: *R. hirsuta* (Guill. & Perr.) Baker occurs in Africa, and *R. indica* (L.) Druce occurs in Asia and Australia. Roth named the latter species *Dillwynia trifoliata* in 1806 (*Dillwynia* Roth, not to be confused with the Australian genus *Dillwynia* J.E.Smith), probably from material from India. *Rothia* was first collected in Australia in 1855 by F. Mueller from Upper Victoria River. He had placed the name *R. lotoides* on the label of this specimen (K) but this name was never published. This specimen was later identified as *R. trifoliata* (Roth) Pers. (= *R. indica*) by Hooker (1859), in the section on tropical Australian flora, and again by Bentham (1864). Both authors refer to this species as also occurring in India.

Examination of specimens of *Rothia indica* collected in India and S.E. Asia indicated that the Australian material belongs to a taxon distinct from that from India and S.E. Asia.

***Rothia indica* (L.) Druce, *Bot. Exch. Club Soc. Brit. Isles* 3:423 (1914)**

Trigonella indica L., *Sp. Pl.* 778 (1753). **Type:** not designated. Original material: India. Hb. Linn. 932.18 (LINN, microfiche BRI).

Rothia trifoliata (Roth) Pers., *Syn Pl.* 2:638 & 659 (1807); *Dillwynia trifoliata* Roth, *Catal. bot.* 3:71 (1806). **Type:** 'horto medico Amsteledamensi', location of specimen unknown.

Prostrate annual, sparsely to densely hairy; hairs long and spreading or short and somewhat appressed, white, golden or reddish. Stems to 40 cm long. Leaves digitately trifoliate; petioles 2–17 mm long, slightly shorter than the leaflets, somewhat flattened; terminal leaflets obovate to oblong, 5–21 mm long, 1.5–6 mm wide, entire, cuneate at base, obtuse or broadly acute at apex, sparsely to densely hairy on both surfaces or nearly glabrous on upper surface; lateral leaflets similar, slightly smaller. Stipules ovate, obovate or elliptic, 2–10 mm long, 1.5–3.5 mm wide, on a stalk less than 1 mm long, acute or obtuse, herbaceous. Inflorescence axil opposed; flowers solitary or paired or 2–4 in short racemes up to 4 mm long; peduncles 0–2 mm long; pedicels 0.5–4 mm long; bracteoles on pedicel filiform, 1–3 mm long. Calyx 4–6.5 mm long, densely hairy; tube campanulate, 1.5–3 mm long, 10-veined, membranous; lobes lanceolate (upper two somewhat falcate), subequal, 2.5–5 mm long, erect. Standard 4–6.5 mm long, 1.5–2 mm wide, pale yellow inside, orange or reddish outside; lamina oblong-ovate, tapered at base, rounded and slightly incurved at apex, hairy along centre of back; claw 1.5–2.5 mm long. Wings 4–6.5 mm long, 1.5–2.5 mm wide; lamina obovate, obtuse at apex; claw c. 2 mm long.

Keel 4–5.5 mm long, 1.5–2.5 mm wide lamina truncate at apex, curved on lower edge; claw c. 2 mm long. Style 1.5–2 mm long, persistent. Stamens monodelphous; staminal tube c. 4 mm long; anthers uniform. Pods erect or spreading, linear to slightly falcate, somewhat flattened,

2–5.5 cm long, 1.5–2.5 mm wide, acute at apex, moderately to densely hairy; hairs spreading or appressed. Seeds 7–16, cuboid, 1.2–2 mm long, 0.7–1.3 mm wide, pale yellow or brown, shiny.

This species occurs throughout Asia and Australia. Two subspecies are recognised here:

Plants sparsely to moderately hairy with appressed hairs; leaflets 8–21 mm long; petioles 5–17 mm long. Inflorescences either with pairs of flowers or 2–4 in short racemes to 4 mm long; pedicels 1–4 mm long; flowers 5–6.5 mm long; calyx 5–6.5 mm long subsp. **indica**

Plants densely hairy with long $\pm$ spreading hairs; leaflets 5–12 mm long; petioles 2–8 mm long. Inflorescence of 1 or 2 flowers not in racemes; pedicels 0.5–3 mm long; flowers 4–5 mm long; calyx 4–6 mm long subsp. **australis**

Rothia indica* subsp. *indica

Illustrations: Wight, *Ic. pl. Ind. orient.*, No. 199 (1840–1853); N.V.Thuan et al., *Fl. Cambodge, Laos, Vietnam* 23: 197, Plate 36 (1–9) (1960); K.M.Matthews, *Fl. Tamilnadu Carnatic*, Plate 219 (1982).

Herb, sparsely or moderately hairy with fine, white, appressed or slightly spreading hairs. Stems to 40 cm long. Petioles 5–17 mm long. Stipules ovate to elliptic to obovate, 3–5 mm long, 1.5–3 mm wide, sparsely to moderately hairy. Leaflets obovate to oblanceolate, 5–21 mm long, 3–6 mm wide. Flowers 2–4, usually on a short peduncle; pedicels 1–4 mm long; bracteoles usually 2–3 mm long. Calyx 5–6.5 mm long, densely hairy with appressed hairs; tube 1.5–2.5 mm long; lobes 2.5–3.5 mm long. Standard 5–6.5 mm long. Wings 4–5.5 mm long. Keel 4–5.5 mm long. Pods densely hairy with long fine appressed hairs.

Specimens examined: **India.** Donkanayi near Mangapadu, Andhra Pradesh, Dec 1967 *Subbarao* 29673 [AD98631173] (AD); Maisor & Carnatic, *without date*, *Thompson* [MEL713522] (MEL); Peninsula Indiae Orientalis, 1866–7, *Wight* 571 [MEL713525] (MEL); Hassan District, Mysore, *Aut* 1971 *Ramamoorthy* (K). **Sri Lanka.** Trincomalee, near China Bay Airport, Feb 1970 *Rudd* 3134 & *Balakrishnan* 3134 (K).

Distribution and habitat: In India and Sri Lanka. Also in S.E. Asia as described by Thuan et al. (1987). Usually occurs in seasonally inundated areas.

Rothia indica* subsp. *australis A.E. Holland, **subsp. nov.**, *Rothiae indicae* (L.) Druce subsp. *indicae*, affinis sed indumento conferto patenti, foliis parvis, et floribus solitariis vel duplicatis, nunquam in racemis differt. **Typus:** Queensland. GREGORY SOUTH DISTRICT: Site 195, Warlus 1, 7 Aug 1971, *D.E. Boyland* 4016 (BRI).

Herb, densely covered in reddish or white, long, spreading hairs. Stems to 30 cm long. Petioles 2–8 mm long. Stipules obovate or elliptic, 2–4 mm long, 1.5–2.6 mm wide. Leaflets obovate to oblong, 5–12 mm long, 1.5–4 mm wide, densely hairy on both surfaces. Flowers 1 or 2; peduncles 0; pedicels 1–4 mm long; bracteoles 1.5–2.5 mm long. Calyx 4–6 mm long, densely patently hairy; tube 1.5–2.5 mm long; lobes 2.5–3.5 mm long. Standard 4–5 mm long. Wings 4–5.5 mm long. Keel 4–5.5 mm long. Pods densely hairy with long fine obliquely spreading hairs. Fig. 1.

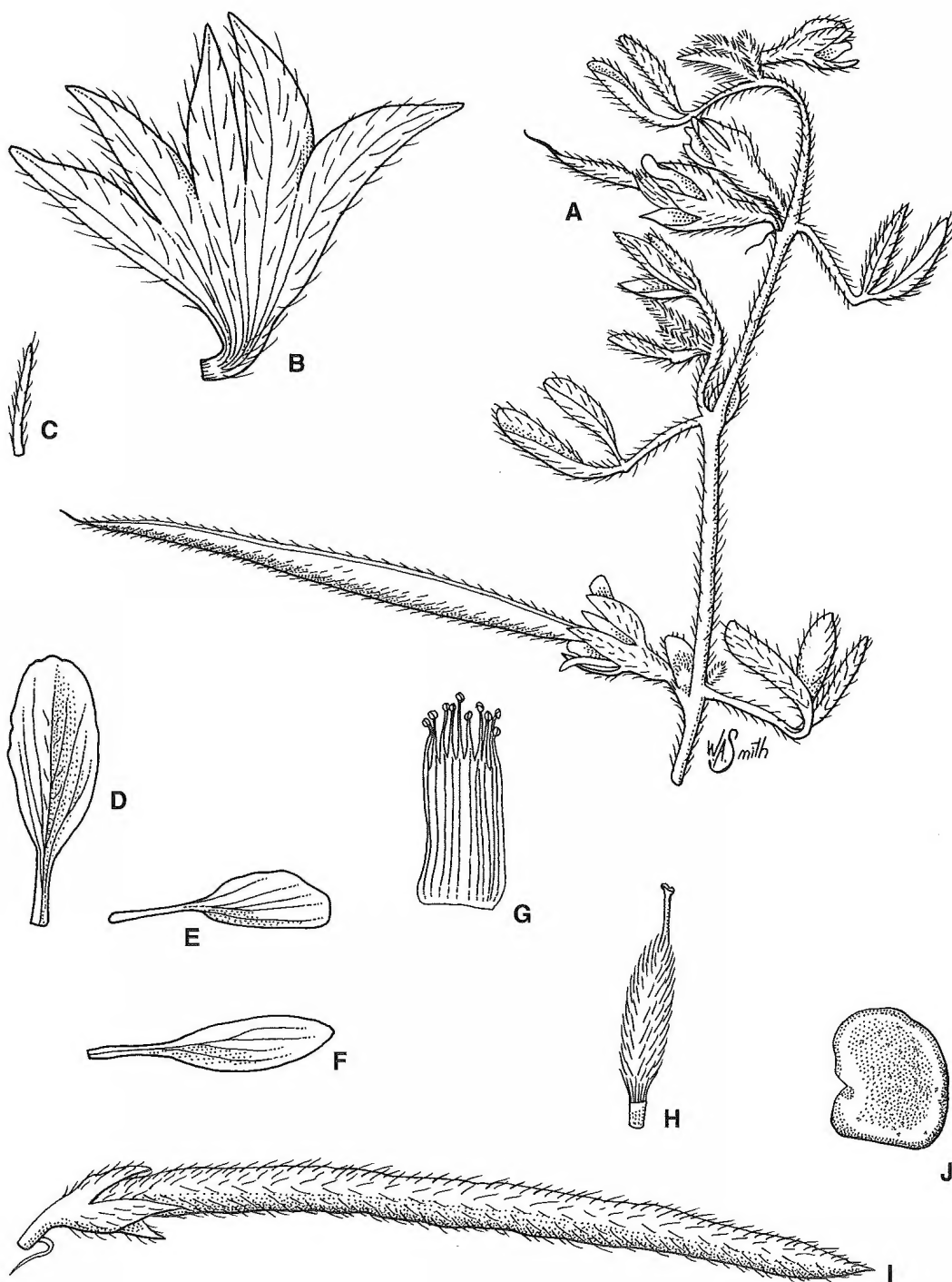


Fig. 1. *Rothia indica* subsp. *australis*: A. branch with immature pod $\times 3.4$. B. calyx $\times 7$. C. bracteole $\times 7$. D. standard $\times 7$. E. wing $\times 7$. F. keel $\times 7$. G. stamens $\times 7$. H. ovary $\times 7$. I. mature pod $\times 3.4$. J. seed $\times 14$. All from *Boyland* 4016.

Specimens examined: **Australia. Western Australia:** Two Mile Ck, May 1941, *Burbidge* 775 (PERTH); Manguel Ck Station, South of Broome-Derby road, Apr 1968, *Payne* S.N. (PERTH). **Northern Territory:** Walker River, May 1993, *Dunlop* 9529 & *Leach* (BRI, DNA); 70km E of Soudan, Wakaya Desert, May 1993, *Latz* 13138 (BRI, DNA); Jitiya Soakage, 4km SE of Lake Suprise, Tanami Desert, Aug 1991, *Latz* 12131 (DNA); Upper Victoria River, in 1855, *Mueller* (K, 2 sheets). **Queensland:** Cook DISTRICT: Junction Ck, Georgetown-Mt Surprise Rd, Jul 1983, *Hacker* 369 (BRI); Black Rock (Lynd), Apr 1981, *Horsup* 111 (BRI). BURKE DISTRICT: road from Lawn Hill to Doomadgee Mission, Jul 1974, *Ollerenshaw*, 1345 & *Kratzing* (BRI); Adel's Grove, via Camooweal, Jun 1950 *de Lestang* 486 (BRI). 64km NW of Richmond, Mar 1995, *Milson* JM826 (BRI). GREGORY NORTH DISTRICT: Currawilla, about 100 mls [160kms] W of Windorah, Jun 1949, *Everist* 3898, (BRI).

Distribution and habitat: This subspecies occurs right across the drier parts of northern Australia. Only 13 collections have been seen. It is found in sandy soils on sandhills and sandy flats.

Phenology: Flowers from April through to August.

Etymology: This subspecies is here named 'australis', because of its southern distribution.

Affinities: The only other presently recognised species of *Rothia*, *R. hirsuta* (Guill. & Perr.) Baker, can easily be distinguished from *R. indica* by the pods which are falcate, less than 12 mm long and tapered at the apex. *R. indica* has pods which are linear, 20–55 mm long and acute at the apex.

Acknowledgements

I am especially grateful for information obtained by Mr Les Pedley and Mr Laurie Jessup while visiting the Herbarium, Royal Botanic Gardens, Kew and to the directors of K, P, PERTH, DNA, MEL, AD and CANB for the loan of specimens and the provision of photographs, photocopies and informaton. Will Smith prepared the illustrations.

References

- BENTHAM, G. (1864). Leguminosae. In *Flora Australiensis* 2:185. London: L.Reeve & Co.
- HOOKE, J.D. (1859, '1860'). *The botany of the Antarctic voyage of H.M. Discovery ships 'Erebus' and 'Terror' in the years 1839–1843*. Part 3 Flora Tasmaniae, Volume 1 Dicotyledons, p.xliii.
- THUAN, N.V. et al. (1987). In *Flora du Cambodge du Laos et du Viêt Nam* 23:197. Paris: Muséum National d'Histoire.

Notes on *Caesalpinia* subg. *Mezoneuron* (Leguminosae: Caesalpinioideae) in Australia

Les Pedley

Summary

Pedley, Les (1997). Notes on *Caesalpinia* subg. *Mezoneuron* (Leguminosae: Caesalpinioideae) in Australia. *Austrobaileya* 5(1): 97–102. *Caesalpinia erythrocarpa* and *C. traceyi*, both from tropical Queensland, are described as new. *C. nitens* is a new combination based on *Pterolobium nitens* Benth. A key to the six species of the subgenus in Australia is provided.

Key words: *Caesalpinia*, *Caesalpinia erythrocarpa*, *Caesalpinia traceyi*, *Caesalpinia nitens*, *Pterolobium nitens*, *Mezoneuron*.

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Introduction

Whether *Mezoneuron* Desf. should be treated as a distinct genus or included in *Caesalpinia* L. is open to question. The two are distinguished mainly by differences of the pod. Species of *Mezoneuron* have pods that are indehiscent, strongly flattened, not or scarcely thickened with a wide wing along the dorsal suture (Brenan 1963). Because of similarities in foliar and floral characters Hattink (1974) treated *Mezoneuron* and *Caesalpinia* as congeneric making a number of new combinations. Vidal & Hul Thol (1976) considered *Mezoneuron* to be a subgenus of *Caesalpinia* but did not effect the transfer. This was left to Herendeen & Zarucchi (1990) who formally treated it as *Caesalpinia* subg. *Mezoneuron* (Desf.) Vidal ex Herend & Zarucchi. They transferred two African species from *Mezoneuron* to *Caesalpinia*. Verdcourt (1979) and Lock (1989), however, had maintained the genus *Mezoneuron*. After a phylogenetic study of *Caesalpinia* sens. lat. Lewis & Schrire (1995) suggested that *Mezoneuron* and other proposed segregates of *Caesalpinia* might well be treated as distinct genera.

Recognition of narrowly circumscribed genera would be in keeping with recent trends in legume systematics (with the curious exception of the Bauhiniineae). However, treatments of caesalpinoid genera are currently being prepared for the *Flora of Australia* and since the results of Lewis & Schrire's ongoing studies are not likely to be available for some time, *Mezoneuron* is treated here as a subgenus of *Caesalpinia*.

The subgenus in Australia is represented by six species, though additional material may indicate that the recognition of five species, one consisting of two subspecies, is more realistic. All are sprawling shrubs or prickly climbers that often flower in the canopy of rainforest trees. Fertile specimens are therefore difficult to collect and some species are poorly represented in herbaria. Nevertheless material available is sufficient for description of previously unrecognised species to be drawn up.

Key to species

1. Ovary and developing pods pubescent; leaflets markedly discolorous,
14–24 mm × 10–16 mm, 1.3–1.7 times longer than wide **C. erythrocarpa**
Ovary and developing pods glabrous; leaflets discolorous or not, often
smaller and more elongate. 2
2. Pinnae 6–11 pairs with 10–22 leaflets per pinna 3
Pinnae (1-)2–8 pairs with 4–14 (rarely 16) leaflets per pinna 4
3. Standard 3.5–4.3 mm long, the claw 1.5 mm long inrolled at top with tuft of
hairs in the tube; pod 3.5–4 cm long, c. 2.5 cm wide **C. traceyi**
Standard 7–8 mm long, the claw 3–4 mm long prolonged into a bilobed
to dentate ligule c. 1 mm long; pod 6–15 cm long, 2–4 cm wide **C. hymenocarpa**
4. Leaflets 9–12 mm × 4.5–6.5 mm; flowers small, mature buds 4–5 mm
long; pods to 3 cm wide **C. subtropica**
Leaflets 10–15(–30) mm × 5–15(–20) mm; flowers larger, mature buds
5–6 mm long; pods (where known) 3.5–5 cm wide 5
5. Pinnae 2–4(–5) pairs; leaflets (2-)4–10 per pinna, glabrous or almost so,
veins apparent beneath, shining above, margins incurved **C. nitens**
Pinnae (3-)4–8(–9); leaflets 10–14(–16) per pinna, sparsely appressed
pubescent beneath, veins not apparent, not shining above **C. scortechinii**

Caesalpinia erythrocarpa Pedley, **sp. nov.**

affinis *C. scortechinii* (F. Muell.) Hattink
a qua foliis plerumque minus elongatis
plerumque pilis minutis appressis infra
sine pilis longis patentibus in venis
obtectis paucioribus in quoque pinna,
ovario pubescenti, leguminibus nervis
tenuibus ornatis differt. **Typus:**
Queensland. Cook District: Rocky River
c. 13°50'S, 143°25'E, 6 September 1973,
B. Hyland 6812 (holo: BRI; iso K, QRS).

C. scortechinii auct. non (F. Muell.) Hattink;
Hattink, *Reinwardtia* 9:52 (1974); Ding
Hou, *Fl. Malesiana* ser.1. 12(2): 552
(1996).

Large scrambling vine, prickles along stems and
leaf-rachises; branchlets with moderately dense
crisped hairs, glabrescent. Leaves opposite or
subopposite; axis 15–20 cm long (including
petiole 3–4 cm) with fulvous crisped hairs,
becoming glabrous, hairs persisting on
secondary axes; pinnae (4-)6 pairs, axis 4–5 cm
long; leaflets alternate, 6–10(–14) in all, obovate

to oblong (occasionally almost orbicular),
rounded, truncate or sometimes slightly
emarginate at apex, (14-)16–20(–24) mm long,
10–14(–16) mm wide, 1.3–1.7 times longer than
wide, markedly discolorous when dry, glabrous
above, sparse minute appressed hairs beneath.
Flowers in racemes forming terminal panicles,
branches opposite, up to 25 cm long with
moderately dense fulvous hairs, bracts early
deciduous, pedicels 3(–5) mm long. Flowers:
sepals, with moderately dense fulvous hairs, the
longest c. 7 mm long, the rest c. 6 mm long, all
c. 3.3 mm wide; corolla with standard 5 mm
long, 4 mm wide, the rest c. 6 mm × 4 mm, all
clawed at the base, the standard with a
prominent flange above the claw; staminal
filaments c. 5 mm long with long hairs
(c. 0.5 mm long) in lower part; ovary felty hairy;
style glabrous, stigma narrowly funnel-shaped.
Pod 1– or 2 - seeded, (3-)4.5–5 cm long,
2.5–3 cm wide, the wing 4–6 mm wide, shining
with finely reticulate nervature, scattered
appressed hairs when young. Fig. 1

Selected specimens: Papua New Guinea. Lake Davumbu, Middle Fly River, Aug 1936, *Brass* 7498 (BRI). Queensland. COOK DISTRICT. Claudie River, 20°43' 143°17', Dec 1994, *Hyland* 21263V (BRI, QRS); Claudie River between Portland Roads and Iron Range, Oct 1968, *Webb & Tracey* 8546 (BRI); Archer River, Jun 1948, *Brass* 19746 (BRI); Stewart River, near Port Stewart, Nov 1965, *Pedley* 1888 (BRI).

Distribution and habitat: Scrambling over trees in riverine rainforest on the eastern side of Cape York Peninsula between about 12½° and 14° latitude, and in southern New Guinea.

Notes: Hattink (1974) who adopted a rather wide concept of species generally, considered *C. scortechinii* ranged from southern Queensland to New Guinea, though he noted that *Brass* 19746 (cited above) might represent a distinct species. This proves to be the case: *C. scortechinii* has more elongate leaflets and smaller flowers and pods and is confined to south-eastern Queensland and north-eastern New South Wales.

Etymology: The specific epithet is derived from Greek *erythros*, red and *carpos*, fruit; both Brass and Hyland noted that immature pods of the species are red.

Caesalpinia traceyi Pedley, *sp. nov.* notabilis propter margines unguis petali posterioris (vexilli) valde involutis in parte supera tubum paene clausum pilis brunneis plus minusve plenum formantes, a *C. scortechinii* (F.Muell.) Hattink pinnis pluribus plerumque foliolis pluribus differt. **Typus:** Queensland. COOK DISTRICT: Kuranda, 16°49'S, 145°38'E, 7 November 1958, *L.S. Smith* 10448 (holo: BRI; iso K).

Large scrambling vine, prickles on stems and leaf rachises; branchlets with sparse fulvous hairs, glabrescent. Leaves usually alternate; axis 16–35 cm long (including petiole 3–6 cm), with fulvous crisped hairs, often patchy often glabrescent, hairs usually persisting on secondary axes; pinnae 7–11 pairs, (2.5–) 4–7 cm long; leaflets alternate (12–) 16–22 per pinna, oblong, rounded or occasionally truncate or emarginate at the apex, 8–19 mm long, 3.5–9 mm wide, 1.7–2.7 times longer than wide, glabrous above, sparsely appressed

pubescent or occasionally glabrous beneath. Flowers in racemes forming terminal panicles, branches ± opposite to c. 12 cm long, rachis with fulvous hairs, bracts c. 2 mm long, early deciduous, pedicels 2–3 mm long. Flowers yellow; longest sepal keeled, c. 5 mm long, 1.5–2 mm wide, the rest rounded, punctulate, 3–4 mm long c. 1.6 mm wide; standard petal 3.5–4.3 mm long with claw c. 1.5 mm long, margins of claw strongly inrolled enclosing a tuft of brown matted hairs, remaining petals 4–4.5 mm long, 2–2.5 mm wide; stamens 4–5.2 mm long, filaments with long tangled hairs in the lower half, anthers glabrous; pistil glabrous. Pods membranous, 3.5–4 cm long, c. 2.5 cm wide including wing c. 4 mm wide, glabrous, finely reticulately nerved. Fig. 1

Selected specimens: Queensland. COOK DISTRICT. between Cairns and Herberton, in 1896, *Wild* AQ 228397 (BRI); S.F.R. 315, c. 1.5 km on Black Mountain road, Jun 1955, *K.J. White* 1021 (BRI); Copperlode Falls Dam, Cairns, Dec 1972 *Birch* 41 (BRI).

Distribution and habitat: Scrambling over trees in rainforest in the Cairns-Cape Tribulation area with an isolated occurrence (*Webb & Tracey* 9967, sterile) near Coen, within the range of *C. erythrocarpa*.

Notes: Related to *C. scortechinii* but has more pinnae and usually more leaflets. The standard petal is most unusual: the upper part of the claw is inrolled to such an extent as to form an almost closed tube more or less filled with brown hair.

Etymology: The species is named in honour of Mr J.G. Tracey of Yungaburra, Queensland who has made significant contributions to the scientific study of the rainforests of Australia and, in more recent years, has worked assiduously in helping to preserve them.

Caesalpinia nitens (F.Muell. ex Benth.) Pedley, *comb. nov.*

Pterolobium nitens F.Muell. ex Benth., Fl. Austral. 2:279 (1864). **Type:** Queensland. Mt Mueller, near Edgcombe Bay, 12 December 1863, *J. Dallachy* s.n. (holo: MEL).

Vine or sprawling shrub, branchlets with

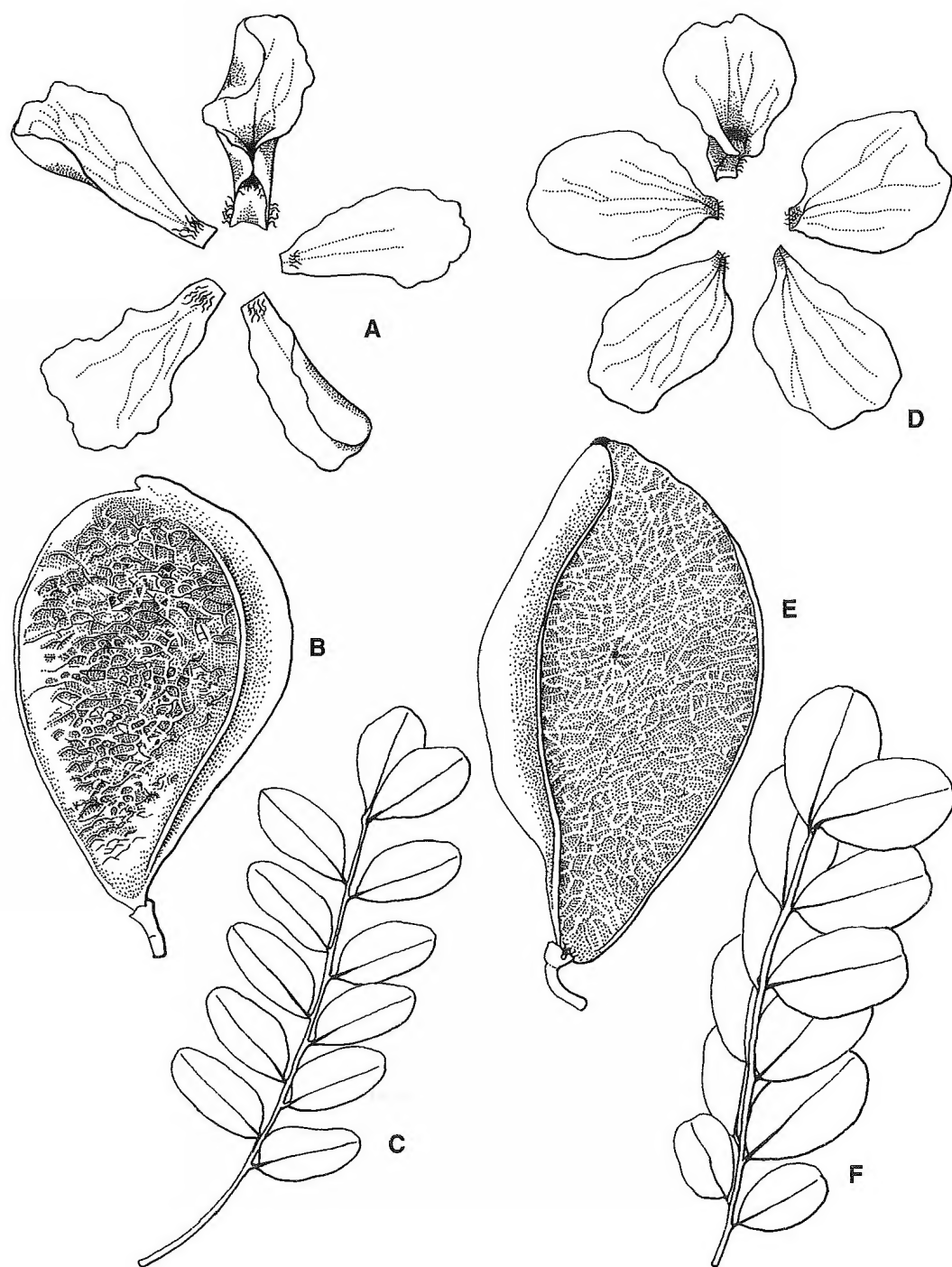


Fig. 1. *Caesalpinia traceyi*. A. petals (standard at top) x 6. B. pod x 1.5. C. pinna x 1. *Caesalpinia erythrocarpa*. D. petals (standard at top) x 4. E. pod x 1.5. F. pinna x 1. A from Smith 10448 (BRI); B, C from Birch 00041 (BRI); D, F from Hyland 6812 (BRI); E from Hyland 6401 (BRI).

small rather rusty dense crisped hairs, glabrescent, scattered dark-tipped prickles; old stems with corky flanges (similar to those of *C. subtropica*). Leaves: axis 4–9 cm long (including petiole 6–20 mm) with indumentum similar to that of branches; pinnae 2–4(–5) pairs with slender, straight or recurved prickles at base of each and usually one or two between them, 5–35 mm long with (2–)4–10 leaflets, alternate to opposite, broadly obovate, rounded to cuneate and slightly emarginate at apex, (7–)10–24(–27) mm long, (5–)7–13(–17) mm wide, (1.2–)1.4–1.7(–2.2) times longer than wide, glabrous or with a few scattered hairs on upper surface when young, margins slightly recurved, shining, particularly above, coarsely anastomosing veins prominent beneath. Flowers in racemes, forming terminal panicles, axis with indumentum of stem, bracts c. 4 mm long pedicels c. 2 mm long. Flowers: sepals densely pubescent at base, the largest 7.5 mm long, 3 mm wide, the remainder 4.5–5 mm long, 2.5–2.8 mm wide; petals clawed, standard 5.5 mm long, 3 mm wide, a minute projecting ridge at top of claw, the remaining petals 5.5–6 mm long, 3–3.7 mm wide; staminal filaments densely hairy in lower half, c. 6 mm long, anthers 1.2 mm long, glabrous; ovary glabrous with one ovule, style straight, stigma narrow funnel-shaped, fringed. Pod not seen.

Specimens examined: Queensland. (all BRI). Scawfell Is., 50 km ENE of Mackay, 20°53'S'E, 149°37'S'E, Nov 1986, *Batianoff* 6189 & *Thompson*; 9.5 km SW of Ubobo, 24°29'S'E, 151°16'S'E, Nov 1995, *Thompson* CAL 358 & *Price*; State Forest 645, N of Gin Gin, 24°51'S'E, 151°58'S'E, Feb 1995, *Bean* 8376; Mt Moororeerai, 26°17'S'E, 152°32'S'E, Oct 1993, *Bean* 6709; c 25 km NW of Didcot, 25°19'S'E, 151°41'S'E, Aug 1995, *Sparshott* KMS 597 & *Turpin*.

Distribution and habitat: Scrambling over vegetation in rainforest in rather dry situations sometimes with unusual associates such as *Archidendropsis thozetiana* and *Barklya syringifolia*, from about Proserpine to the vicinity of Nambour. The type locality, Mt Mueller, is the present-day Mt Millar (c. 20°33' 148°43') near Bloomsbury (Blake 1955) near the northern limit of the range of the species.

Notes: Closely related to *C. scortechinii* which occurs in wetter rainforests and which may prove to be only subspecifically distinct. *C. nitens* has leaves with fewer pinnae, fewer leaflets per pinna and, most obviously, by its virtually glabrous leaflets with shining upper surfaces and anastomosing veins on the lower surfaces. The corky flanges on the stem suggests a relationship with *C. subtropica* but that species has smaller leaflets not more than 12 mm long and rarely more than 6 mm wide.

Bentham (1864) described *Mezoneuron brachycarpum* (= *Caesalpinia subtropica*) and *Pterolobium nitens* on successive pages, the latter from a single collection. Though Mueller (1876) listed two additional specimens of *P. nitens* which were again cited by Bailey (1900), no specimens of the species were recognised at BRI. Vidal & Hul Thol (1974) excluded *P. nitens* from *Pterolobium* and referred it to *Caesalpinia brachycarpa* (Benth.) Hattink. In transferring *M. brachycarpum* to *Caesalpinia*, however, Hattink (1974) made no reference to *P. nitens*. When proposing *C. subtropica* as a *nomen novum* for *C. brachycarpa* (Pedley, 1977) I was not aware of Vidal & Hul Thol's reference to Hattink's name. Examination of type material of *Pterolobium nitens* showed it to be different from both *C. brachycarpa* and *C. scortechinii*.

Acknowledgment

I am grateful to the Chief Botanist, National Herbarium of Melbourne (MEL) for lending the type material of *Pterolobium nitens*.

References

- BAILEY, F.M. (1900). *The Queensland Flora* 2:452. Brisbane: Diddams & Co.
- BENTHAM, G. (1864). *Flora Australiensis* 2:278–279. London: Lovell Reeve & Co.
- BLAKE, S.T. (1955). Some pioneers of plant exploration and classification. *Proceedings of the Royal Society of Queensland* 66:1–19.
- BRENAN, J.P.M. (1963). Notes on African Caesalpinioideae. *Kew Bulletin* 17:197–214.
- HATTINK, T.A. (1974). A revision of Malesian *Caesalpinia*, including *Mezoneuron* (Leguminosae–Caesalpinioideae). *Reinwardtia* 9: 1–69.

- HERENDEEN, P.S. & ZARUCCHI, J.L. (1990). Validation of *Caesalpinia* subgenus *Mezoneuron* (Desf.) Vidal and new combinations in *Caesalpinia* for two species of *Mezoneuron* from Africa. *Annals of the Missouri Botanical Garden* 77:854–855.
- LEWIS, G.P. & SCHRIRE, B.D. (1995). A reappraisal of the *Caesalpinia* group (Caesalpinioideae–Caesalpinineae) using phylogenetic analysis. In M.Crisp & J.J.Doyle (ed.): *Advances in Legume Systematics* 7:41–52.
- LOCK, J.M. (1989). *Legumes of Africa - A check-list*. Royal Botanic Gardens, Kew.
- MUELLER, F. (1876). *Fragmenta Phytographiae Australiae* 10:7 Melbourne:Victorian Government.
- PEDLEY, L. (1977). Notes on Leguminosae. 1. *Austrobaileya* 1:33–34.
- VERDCOURT, B. (1979). *Manual of New Guinea legumes*. 18–20. Lae: Office of Forests, Botany Bulletin no. 11.
- VIDAL, J.E. & HUL THOL, S. (1974). Revision du genre *Pterolobium* (Caesalpinaceae). *Bulletin du museum d'histoire naturelle*, Paris, serie 3, 227 (Botanique 15): 1–29.

Guioa sarcopterifructa (Sapindaceae): a new Australian species

Peter C. van Welzen

Summary

van Welzen, P.C. (1997). *Guioa sarcopterifructa* (Sapindaceae): a new Australian species. *Austrobaileya* 5(1): 103–105. Australian specimens originally identified as *Guioa pteropoda* Radlk., a species only known from the Indonesian Moluccas and New Guinea, are described as a new species, *Guioa sarcopterifructa*, because the fruits are reminiscent of the genus *Sarcopteryx*. Typical are the crenate leaflets, with a highly inserted domatium, and deviating angle of the nerve below the domatium.

Keywords: Sapindaceae, *Guioa crenifoliola*, *Guioa pteropoda*, *Guioa sarcopterifructa*.

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Introduction

Several sterile specimens from northeast Queensland were initially identified as *Guioa crenifoliola* Merr. & Perry by Reynolds (1984, 1985). Fruiting material was subsequently illustrated by Cooper & Cooper (1994) who identified their collection as *G. pteropoda* Radlk. of which *G. crenifoliola* is now considered to be a synonym (van Welzen 1989). *G. pteropoda* was only known from a few localities in northwest Irian Jaya (van Welzen 1989), although recently also material became available from Ceram in the Moluccas. The disjunction in distribution with the Australian specimens is large, which makes conspecificity doubtful. Another reason to doubt the identification of the Australian specimens is the fact that all other Australian species of *Guioa* do not show a close relationship with *G. pteropoda* (van Welzen 1989). The status of the Australian populations is examined in the current paper in the light of the additional fertile specimens now available. The fruits of the Australian material strongly resemble those of the genus *Sarcopteryx* in possessing very sharp and winged edges. Several characters are incompatible with *Sarcopteryx*, like the crenate margin of the leaflets, the large domatia, an indistinct reticulation of the veins, biseriate ovate sepals, horseshoe-shaped discs, leathery fruits, absence

of hairs below the placenta, and a curled instead of a straight pseudofuncle of the arillode. All the latter characters agree with the genus *Guioa*, especially with the species *G. pteropoda*. *G. pteropoda*, unlike any other species of *Guioa*, also possesses sharply edged and winged fruits. However, a few differences with *G. pteropoda* exist, the Australian specimens have larger fruits, smaller leaflets, and the domatia are much larger and they are found in the axil of the fourth nerve instead of the first or second, while the nerve under the domatium has a different angle with the midrib than the other nerves (in *G. pteropoda* all nerves have the same angle). Unfortunately, flowering specimens are lacking. The specimen I could examine had a few badly conserved petals, which broke apart when touched. These petals were very small, shorter than the sepals. This agrees quite well with the other Australian species of *Guioa*, but it is quite unlike the well-developed petals of *G. pteropoda*.

The resemblance with *G. pteropoda* is partly based on the retention of juvenile characters. Seedlings of *Guioa* show slightly winged rachises, crenate leaflets, a lack of papillae on the lower surface of the leaflets (all other mainland Australian species are papillate), and usually a lack of domatia. On the other hand, the fruits of both species are very typical and the discs very asymmetric; this may indicate a close relationship between both species, because these are obviously

apomorphic traits in *Guioa*, though parallelisms are possible. If the two species are related, then a historical biogeographical explanation of their distributions will be a difficult but interesting analysis.

Taxonomy

Guioa sarcopterifructa Welzen, sp. nov.

Folioli crenati domatia sacciformes in axilla nervi quarti laminarum cum nervo eodem ad angulam acutiorum patenti quam nervos alios, margines fructuum acuti alatique. **Typus:** Queensland. COOK DISTRICT: Big Tableland, 15°42'S, 145°16'E, 9 Jan 1996, K.R. McDonald 21 (holo: QRS; iso: L).

G. crenifoliola auct. non Merr. & L.M. Perry: S.T. Reynolds, *Austrobaileya* 2: (1984) 37, fig. 2k, l; in *Flora of Australia* 25: 47, map 56 (1985).

G. pteropoda auct. non Radlk.: W. Cooper & W.T. Cooper, *Fruits of the Rain Forest* 510, fig. 310 (1994).

Illustrations: Cooper & Cooper (1994, fig. 310); Reynolds (1984, fig. 2k, l; 1985, map 56).

Small tree, up to 6 m tall. Leaves paripinnate, alternate, 4–6-jugate; rachis 7–12.5 cm long, slightly winged; leaflets opposite to subopposite, (sub)sessile, elliptic, 3–5.5 × 1–1.5 cm, asymmetric, acroscopic side wider, base strongly asymmetric, attenuate, margin crenate, apex acuminate, very apex rounded, glabrous, lower surface lighter when dry, domatia absent or a single large sac with apical pore in axil of fourth nerve; venation very indistinct, nerves marginally looped and joined, nerve below domatium possessing sharper angle with midrib than other nerves. Inflorescences subterminally axillary, presumably thyrsoid, up to c. 10 cm long. Flowers not seen. Sepals 5, ovate, outer 2 smaller, 2.2–2.5 × 2–3 mm, inner 3 larger, 2.2–2.8 × 2.5–4 mm, margin with glandular hairs. Petals: only remnants seen, smaller than sepals. Disc strongly horseshoe-like, smooth, glabrous. Fruit capsular, 3-lobed, obcordate, c. 2.5 cm high, 2.7 cm broad, loculicidal, leathery, thin-walled, smooth, glabrous, pink to red, margins sharp, winged. Seed ovoid,

c. 8 × 6 mm, blackish brown; enveloped by an orange arillode; latter apically open, basally with a curled extension attaching to endocarp, seed dangling from it after dehiscence. Cotyledons unequal, curled together like a hand-shake. Seedlings epigeal; cotyledons thick, c. 17 × 4–5 mm, irregular, keeled below, margin entire or with a few small teeth, ciliate, venation indistinct; first pair of leaves opposite, imparipinnate with c. 4 jugae, rachis winged, leaflets with 2–4 deep teeth, domatia present.

Additional specimens studied: Queensland. COOK DISTRICT: Big Tableland, Jan. 1994, Cooper & Cooper 734 (QRS); Windsor Tableland (Northeast of Mt. Carbine), June 1969, Hyland 2311 (BRI); Gold Hill near China Camp, July 1973, Webb & Tracey 13314 (BRI).

Distribution and habitat:

Guioa sarcopterifructa is endemic in northeastern Queensland, Windsor Tableland to Big Tableland, in upland rainforest; alt. 400–1000 m.

Etymology: The specific epithet refers to the close resemblance with the fruits of the genus *Sarcopteryx* (Sapindaceae).

Note: The key to the genera of Sapindaceae in the *Flora of Australia* (Reynolds 1985) does not have to be changed, but floral characters, which are for instance needed in lead 20, 21, are still absent. It is unknown whether or not *G. sarcopterifructa* has scales.

The key to the species of *Guioa* (Reynolds 1985: 47) only needs a minor change, the name *G. crenifoliola* has to be changed to *G. sarcopterifructa*. The description can be replaced with the one presented above.

Acknowledgements

Sally Reynolds pointed my attention to the fact that fruiting specimens have been found of what was hitherto known as *Guioa crenifoliola* or *G. pteropoda*. On behalf of Bernie Hyland, Rebel Elick was so kind to send a specimen for study. I am also glad that Hans-Joachim Esser was willing to make the Latin description. Bernie Hyland added information on seedlings and suggested a few improvements to the manuscript, which were gladly added. An anonymous referee is thanked for his useful comments.

References

- COOPER, W. & COOPER, W.T. (1994). *Fruits of the Rain Forest*: 154, 155, text & fig. 310. Chatswood: Geo Productions Pty Ltd.
- REYNOLDS, S.T. (1984). Notes on Sapindaceae, III. *Austrobailyea* 2: 37, 40, fig. 2k, l.
- (1985). Sapindaceae, *Flora of Australia* 25: 4–8, 47–51, map 56. Canberra: Australian Government Publishing Service.
- WELZEN, P.C. VAN (1989). *Guioa* Cav. (Sapindaceae): taxonomy, phylogeny, and historical biogeography. *Leiden Botanical Series* 12: 51–95, 268, 269.

Capparis velutina (Capparaceae), a new species from south-eastern Queensland

Paul I. Forster

Summary

Forster, Paul I. (1997). *Capparis velutina* (Capparaceae), a new species from south-eastern Queensland. *Austrobaileya* 5(1): 107–111. *Capparis velutina* (*Capparis* section *Busbeckea* (Endl.) Hook.f.), a new species allied to *C. arborea* (F.Muell.) Maiden, is described and illustrated. Information is provided on its distribution, habitat and conservation status.

Keywords: *Capparis velutina*, *Capparis arborea*, Capparaceae, Queensland, New South Wales.

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Introduction

An undescribed species of *Capparis* belonging to *C.* section *Busbeckea* (Endl.) Hook.f. has been recognised to occur in south-eastern Queensland for some time and has been variously referred to as *C.* sp. 'hairy leaves' (unpublished plant lists), *C.* sp. 'Bulburin' (unpublished plant lists), *C.* (P.I.Forster 6620) (Forster et al. 1991) or *C.* sp. (Coen L.S.Smith 11862) (Jessup 1994). This taxon was first formally recognised as *Capparis nobilis* var. *pubescens* Benth. (Bentham 1863) based on a collection by Alan Cunningham from Moreton Bay, but was reduced to synonymy under *C. arborea* (F.Muell.) Maiden by Jacobs (1965), albeit with some doubt.

In the 'Flora of Australia' treatment of *Capparis* by Hewson (1984), *C. nobilis* var. *pubescens* was included in the synonymy of *C. arborea*, but one specimen of this taxon (McDonald 3223 et al. (BRI)) was cited as a representative specimen under an entity named *Capparis* sp. A. I believe that Hewson's concept of *Capparis* sp. A covers at least two entities. One appears to be endemic to the McIlwraith Range in far north Queensland and has distinctive elongate fruit and more or less glabrous foliage (e.g. Smith 11862), whereas the other is endemic to south-eastern Queensland and north-eastern New South Wales, and has globose fruit and a distinctive

velutinous, hairy lower leaf lamina surface. Both taxa have been previously lumped together at BRI with most collections being sterile or with only buds.

Unfortunately, no additional fertile collections of the taxon from the McIlwraith Range have been made since that of Smith, hence it remains unnamed for the time being and retains the code name of *C.* sp. (Coen L.S.Smith 11862). Recent fertile collections of the second species now enable its formal description and it is named here as *C. velutina*.

Materials and methods

This paper is based on specimen holdings at BRI and QRS, type material at BM, and field observations by the author. Terminology and structure of the description largely follow Jacobs (1965).

Abbreviations: T.R. = Timber Reserve; S.F. = State Forest, L.A. = Logging Area.

Taxonomy

***Capparis velutina* P.I.Forst., sp. nov.** affinis *C. arborea* (F.Muell.) Maiden autem planta volubili scandentive caulibus floriferis spinosis, folio lamina infra velutina mucrone 1–2 mm longo venis lateralibus infra prominenter elavatis praedita, sepalis interioribus angustioribus 4.0–6.5 mm latis differt. **Typus:** Queensland. PORT CURTIS DISTRICT: State

Forest 391 Bulburin, Resumption Logging Area, 29 Dec 1994, *P.I. Forster* PIF16004, + *G. Smyrell, M.C. Tucker & D. Orford* (holo: BRI [2 sheets + spirit]; iso: A, K, L, MEL, NSW, QRS).

Capparis nobilis var. *pubescens* Benth., Fl. Austral. 1:96 (1863). **Type:** Queensland. MORETON DISTRICT: Brisbane River, *A. Cunningham* (holo: BM [000031692] labelled as '*Capparis laurifolia*' in Cunningham's hand).

Scrambler or vine up to 20 m long; trunk woody and up to 10 cm diameter. Juvenile shoots, 1st and 2nd stages: twigs with short, dense, simple, erect, brownish hairs of unequal length, internodes 7–20 mm long. Thorns acicular, straight, patent to sometimes divaricate, 2–10 mm long. Leaves distichous, petioles 1–2 mm long, lamina ovate, 15–50 mm long, 12–25 mm wide, apex acute to acuminate, mucronate (mucro 1–2 mm long), base cordate, rounded or truncate, coriaceous; upper surface glabrous, dark glossy green, lower surface velutinous with sparse, erect, brownish hairs; lateral veins 4–7 pairs, raised below, interlateral reticulate veins $\pm$ obscure. Adult shoots: twigs with short, dense, simple, erect to slightly antrorse, brownish hairs of unequal length; internodes 10–20 mm long. Thorns usually present, recurved, 1–4 mm long. Leaves spirally arranged; petioles 3–7 mm long, indumentum as on twigs; lamina elliptic to elliptic-ovate, 25–130 mm long, 20–50 mm wide, apex acute to rounded with a pronounced mucro (this 1–2 mm long), base cordate, cuneate or rounded, coriaceous; upper surface dull-green, glabrous, midrib shallowly sunken; lower surface pale tan, with short, sparse to dense, erect to slightly antrorse, simple brownish hairs, midrib raised, margin often slightly recurved; lateral veins in 7–12 pairs, prominently raised below, interlateral reticulate veins just visible below. Flowers, axillary, solitary, collateral in pairs, or in racemes with a slender rachis up to 12 mm long; bracts small, lanceolate or spine-like; pedicels 17–28 mm long, c. 1 mm diameter, with sparse, antrorse, simple, brownish hairs; flower buds globose, shortly pointed, smooth; outer sepals fused in bud, $\pm$ ovate, $\pm$ cucullate, 7–11 mm long,

8–11 mm wide, coriaceous, minutely hairy externally; inner sepals free, narrow-obovate, $\pm$ flattened, 8–12 mm long, 4–6.5 mm wide, glabrous or minutely and irregularly marginally ciliate, somewhat thickened in middle; petals broadly obovate, 15–25 mm long, 7–10 mm wide, flabellate, cream-white, loosely hairy inside for entire length or mainly in lower half, margin somewhat fimbriate in upper half; stamens 80–100, anthers narrow-oblong, 1.5–1.6 mm long, c. 0.5 mm wide, cream, filaments filiform, 13–15 mm long, cream; gynophore filiform, 10–17 mm long, c. 0.5 mm diameter, cream, glabrous, ovary ovoid, 2–3 mm long, 1.8–2.0 mm diameter, glabrous, green, stigma inconspicuous. Fruit on a stipe 10–15 mm long, globose, incrassate, 35–40 mm diameter; seeds c. 5 mm long (immature). *Hairy caper*. Fig. 1.

Selected additional specimens examined: Queensland.

PORT CURTIS DISTRICT: 2.5 km N of Glassford Vale, T.R. 353, 24°34'S, 151°18'E, Sep 1989, *Forster* 5678 & *Bean* (BRI); S.F. 471, Mt Coulston, 24°11'S, 151°26'E, Oct 1989, *Forster* 5810 & *Bean* (BRI); Resumption L.A., S.F. 391 Bulburin, 24°32'S, 151°28'E, Dec 1993, *Forster* 14542 et al. (BRI); Scott Road, 4 km from old barracks site, Boyne L.A., S.F. 391 Bulburin, 24°32'S, 151°29'E, Dec 1993, *Forster* 14566 (BRI); T.R. 115, Mt Coulston, 9 km NNW of Bororen, 24°11'S, 151°26'E, Sep 1989, *Gibson* TOI814 (BRI, L); S.F. 67 Bulburin, Jul 1978, *McDonald* 2369 & *Stanton* (BRI); S.F. 67 Bulburin, vicinity of Forest Station, Apr 1980, *McDonald* 3223 et al. (BRI); S.F. 67 Bulburin, vicinity of Forest Station, Apr 1980, *McDonald* 3224 et al. (BRI); S.F. 391 Bulburin, vicinity of Forest Station, Nov 1981, *McDonald* 3425 (BRI). WIDE BAY DISTRICT: NW slopes of Mt Glastonbury, 26°14'S, 152°27'E, Dec 1991, *Forster* 9274 & *Sharpe* (BRI); Fireclay Scrub, Wrattens S.F., S.F. 639 Widgee, 26°15'S, 152°19'E, Feb 1988, *McDonald* 4162 (BRI, NSW); Imbil, Jan 1918, *Weatherhead* 381 (BRI). DARLING DOWNS DISTRICT: SW slope of Wilsons Peak, 28°15'S, 152°29'E, Jan 1990, *Forster* 6220 et al. (BRI); Warwick district, Jan 1919, *Moore* 8 (BRI). MORETON DISTRICT: Three Mile Scrub, Newmarket, Jan 1891, *Bailey* [AQ028017] (BRI); 2 km E of Mt Brisbane, Rough L.A., T.R. 209, 27°06'S, 152°33'E, Apr 1989, *Forster* 5038 (BRI, CANB, K, MEL); Nineteen L.A., T.R. 209, Mt Brisbane, 27°06'S, 152°32'E, Jun 1990, *Forster* 6868 et al. (BRI, QRS); Mt Lindesay, 28°20'S, 152°42'E, Oct 1992, *Forster* 12183 & *Leiper* (BRI); Blackall Range, Apr 1918, *White* [AQ028016] (BRI). NEW SOUTH WALES. Acacia Creek, Feb 1905, *Boorman* [AQ027999] (BRI ex NSW).

Distribution and habitat: *Capparis velutina* is endemic to south-eastern Queensland and north-eastern New South Wales from

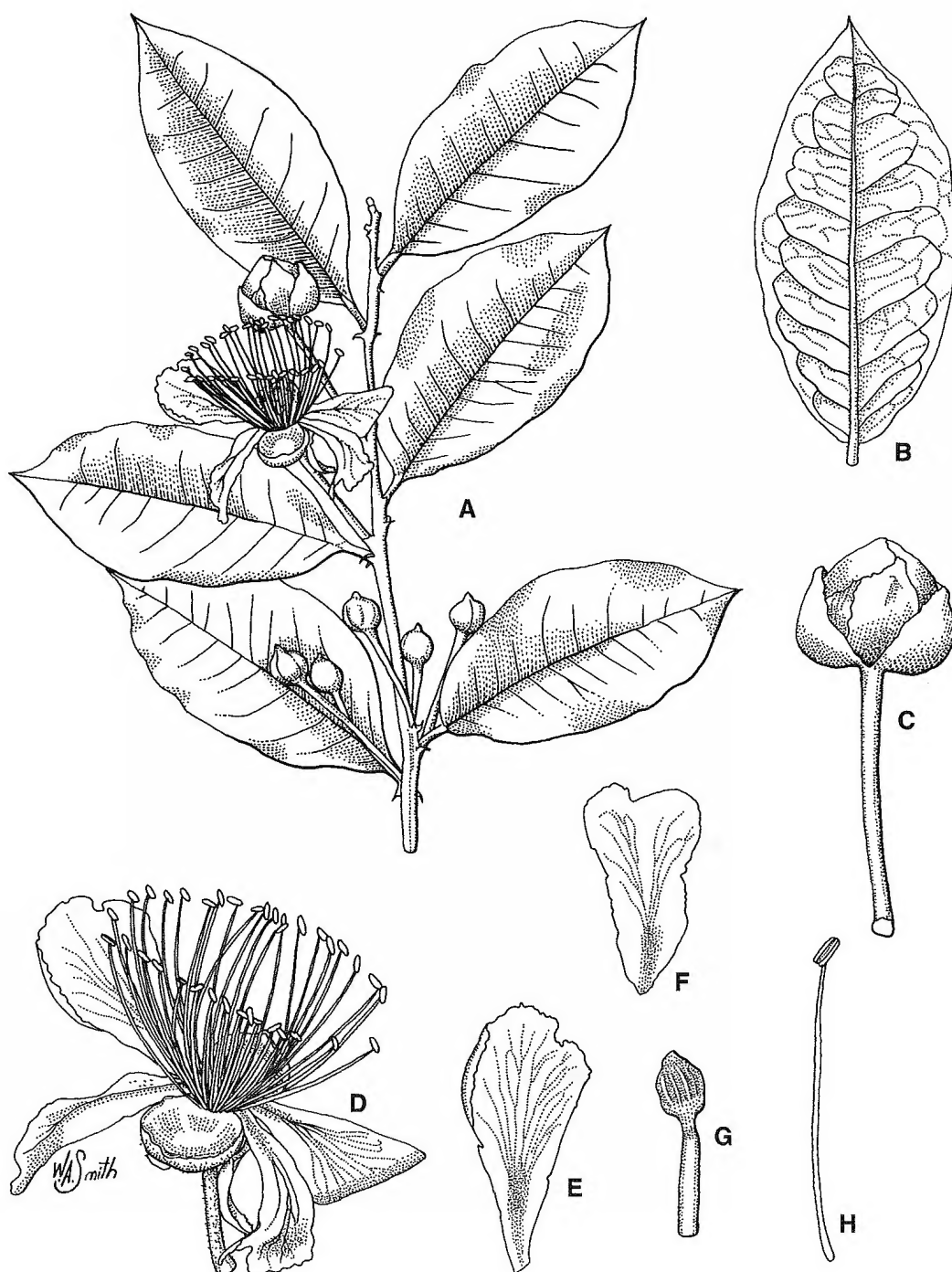
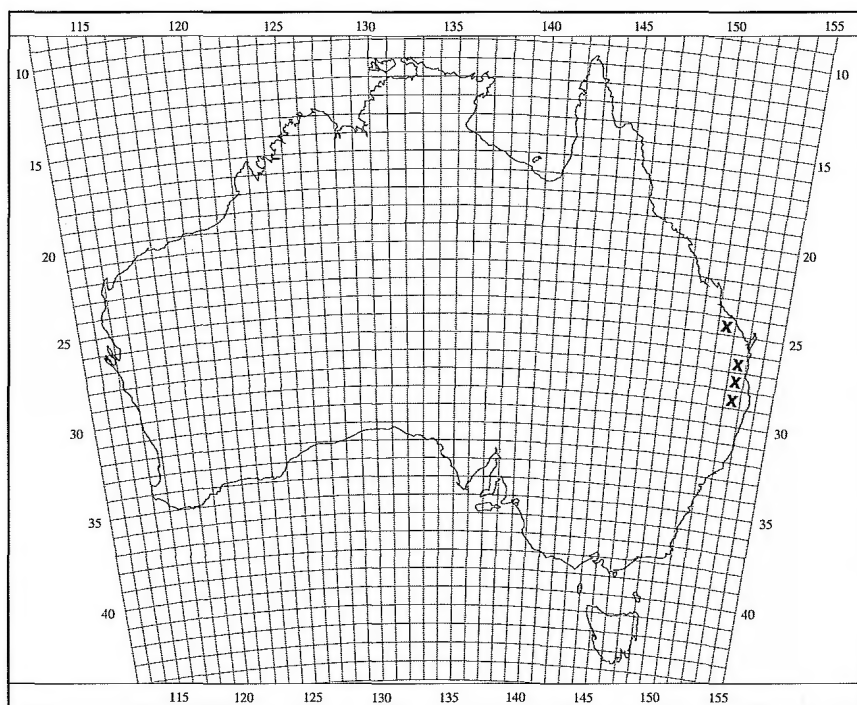


Fig. 1. *Capparis velutina*. A. flowering branchlet $\times 0.8$. B. undersurface of leaf showing venation $\times 1$. C. bud just before anthesis $\times 1.5$. D. lateral view of flower $\times 1.5$. E-F. petals $\times 1.5$. G. style $\times 5$. H. stamen $\times 2$. All from Forster 16004 (BRI). Del. W. Smith.

Mt Coulston in the north to Acacia Creek in the south (Map 1). According to Floyd (1989) this species occurs from the Macleay River north to Acacia Creek in New South Wales. I have not seen any specimens to support this statement.

Capparis velutina occurs in complex notophyll vineforest (usually araucarian) often on red soils derived from rhyolite or related rock substrates. These vineforests are often dominated by species of *Argyrodendron* and *Araucaria cunninghamii*.

Notes: *Capparis velutina* appears to be allied to *C. arborea* and they occur sympatrically at many localities. Maiden & Betche (1905), when discussing *C. nobilis* var. *pubescens*, noted that it differed from *C. arborea* (as *C. nobilis*) in the climbing habit, smaller flowers with pale blue stamens, and the branches and underside of the leaves densely covered with short soft hairs. With the greater number of specimens now available, it is now possible to state that the two taxa differ in many character states. Major differences are summarised in Table 1. As well as these differences, *C. velutina* also appears to have smaller flowers (supporting Maiden & Betche's observations) and broader, thicker leaves than *C. arborea*, but I have not observed pale blue stamens.



Map 1. Distribution of *Capparis velutina* in 1° grid squares.

Table 1. Morphological comparison of *Capparis arborea* and *C. velutina*.

Character	<i>C. arborea</i>	<i>C. velutina</i>
habit	shrub/small tree	scrambler or vine
flower bearing stems	spineless	spinose
leaf lamina undersurface	glabrous	velutinous hairy
leaf lamina mucro	short (< 1 mm)	long (1–2 mm)
leaf lamina lateral veins below	indistinct	prominently raised
inner sepal width	8–11 mm	4.0–6.5 mm

Specimens of *Capparis* are renowned for being difficult to identify and the only real solution to this is to use adequate fertile material. However, *Capparis velutina* is relatively easy to identify, even from sterile collections, due to the distinctive velutinous, hairy lower leaf lamina. In Hewson's (1984) key to the Australian taxa of *Capparis*, *C. velutina* will key to *C. arborea* but may be distinguished by the characters outlined above.

Floyd (1989) referred to this plant as 'var. pubescens' under his account of *C. arborea*; however, no formal combination of Bentham's variety under that species name has ever been made.

Conservation status: *Capparis velutina* is known to occur in at least thirteen localities, including three conservation reserves (Forster et al. 1991). It is usually relatively common where it does occur and none of the known localities are under any direct threat for the present. Hence, while it is not a particularly common plant, it should not be considered as rare or threatened.

Etymology: The specific epithet is derived from the Latin *velutinus* (velutinous) and alludes to the distinctive indumentum cover on the lower surface of the leaf lamina.

Acknowledgments

W. Smith (BRI) for the illustrations. A.R.Bean, L.H.Bird, D.Orford, P.R.Sharpe, G.Smyrell and M.C.Tucker for assistance in the field on occasions when this plant has been collected. L.Pedley (BRI) for the Latin translation. A.R.Bean for comments on a draft of the manuscript. The Director, Dept Botany, Natural History Museum (BM), for loan of relevant material.

References

- BENTHAM, G. (1863). Capparidae. In *Flora Australiensis* 1: 89–98. London: L. Reeve & Co.
- FLOYD, A.G. (1989). *Rainforest Trees of Mainland South-eastern Australia*. Melbourne/Sydney: Inkata Press.
- FORSTER, P.I., BOSTOCK, P.D., BIRD, L.H. & BEAN, A.R. (1991). *Vineforest Plant Atlas for South-east Queensland*. Brisbane: Queensland Herbarium.
- HEWSON, H.J. (1984). Capparaceae. In A.S.George (exec. ed.), *Flora of Australia* 8: 207–231.
- JACOBS, M. (1965). The genus *Capparis* (Capparaceae) from the Indus to the Pacific. *Blumea* 12:385–541.
- JESSUP, L.W. (1994). Capparaceae. In R.J.F.Henderson (ed.), *Queensland Vascular Plants, Names and Distribution*. Brisbane: Queensland Department of Environment & Heritage.
- MAIDEN, J.H. & BETCHE, E. (1905). Notes from the Botanic Gardens, Sydney. *Proceedings of the Linnean Society of New South Wales* 30: 354–375.

Notes on the naturalised Flora of Queensland, 3*

Paul I. Forster

Summary

Forster, P.I. (1997). Notes on the naturalised flora of Queensland, 3. *Austrobaileya* 5(1): 113–119. Naturalisations in Queensland are documented for *Graptopetalum paraguayense* (N.E.Br.) Walther (Crassulaceae), *Kalanchoe lateritia* Engl. (Crassulaceae), *Jasminum mesneyi* Hance (Oleaceae), *Jatropha podagrica* Hook. (Euphorbiaceae), *Manihot esculenta* Crantz (Euphorbiaceae), *M. grahamii* Hook., *M. glaziovii* Muell.Arg., *Persicaria capitata* (Buch.-Ham. ex D.Don) H.Gross (Polygonaceae), *Sedum praealtum* A.DC. (Crassulaceae) and *Vernicia fordii* (Hemsl.) Airy Shaw (Euphorbiaceae). A generic key to naturalised genera of Crassulaceae, and a key and descriptions of the naturalised species of *Manihot* are presented. Orthography of the family name Aloaceae is highlighted and name changes in *Aloe* L. discussed.

Keywords: *Graptopetalum paraguayense*, *Kalanchoe lateritia*, *Jasminum mesneyi*, *Manihot glaziovii*, *Manihot esculenta*, *Manihot grahamii*, *Jatropha podagrica*, *Persicaria capitata*, *Sedum praealtum*, *Vernicia fordii*, *Aloe maculata*, Queensland Flora

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Introduction

The flora of Queensland continues to increase, not only from the number of recognised indigenous flora, but from an ever burgeoning range of exotics that may be considered as naturalised. Few of these ‘alien’ plants (viz. Johnson 1995) pose much threat in the long term or have the potential to become serious weeds in natural or man-made ecosystems. Nevertheless, documentation of their naturalisation together with accurate identification remains an important priority for long-term management as some plants have been known to become serious weeds after many years of low-level naturalisation.

Plants considered naturalised in Queensland have recently been listed in Henderson (1997), updating the listing in Henderson (1994) and in a number of accounts in the ‘Flora of Australia’. This paper documents nine taxa from diverse families that can be considered as naturalised in Queensland with three representing additional taxa to those listed in Henderson (1997). Nearly all should be labelled as ‘adventive’ (sensu Kloot 1987)

at this stage. Kloot (1987) defined five categories of naturalisation, of which the categories ‘adventive’ and ‘established’ are most relevant here. ‘Adventive’ was defined by Kloot (1987) as “A plant that is persisting without, or in spite of, human intervention at one or few separate locations, generally for less than 25 years. Generally reproducing only sparingly”. This category is suitable for many of the garden escapees that are found near to habitation. ‘Established’ was defined by Kloot (1987) as “where an alien plant is widespread over large parts...or locally abundant in one or more regions, and generally reproducing freely”.

Four of the species documented below are succulents additional to those listed elsewhere (Forster 1996b); these are plants that are invariably poorly represented in the herbarium record due to difficulty with specimen preparation. In addition original keys for some taxa are given to enable identification and some nomenclatural matters are discussed that update previous accounts in the ‘Flora of Australia’.

Materials and Methods

Taxa discussed in this paper are based on collections in the Queensland Herbarium (BRI).

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* Part 2: *Austrobaileya* 3:761–763 (1992).

New Naturalisation Records

CRASSULACEAE

Graptopetalum Rose

This is the first record of the genus becoming naturalised.

1. **Graptopetalum paraguayense** (N.E.Br.) Walther, Cact. Succ. J. (Los Angeles) 9: 108 (1938).

Two subspecies are known with *G. paraguayense* subsp. *paraguayense* recorded here.

Specimen examined: Queensland. MORTON DISTRICT: Boyce's Quarry project, Bundamba TAFE College, Ipswich, Oct 1995, Forster PIF17876, Bird & Figg (AD, BRI).

Notes: *G. paraguayense* subsp. *paraguayense*, despite the specific epithet, is thought to be native to Mexico but has never been recollected from a known wild locality since its introduction to horticulture in the 1800s. A second subspecies, *G. paraguayense* subsp. *bernalense* Kimn. & Moran is native to Tamaulipas, Mexico (Kimnach & Moran 1986). This species propagates from fallen leaves or stem sections and is a localised adventive at the given locality.

Kalanchoe Adans.

This is the first record of this genus becoming naturalised.

2. **Kalanchoe lateritia** Engl., Pflanzenw. Ost-Afr. C. 189 (1895).

Three varieties are recognised within *K. lateritia* (Raadts 1977; Wickens 1987) with *K. lateritia* var. *lateritia* recorded here.

Specimen examined: Queensland. BURNETT DISTRICT: Neurum Creek, c. 21 km SW of Gin Gin, 25° 07'S, 151° 48'E, May 1995, Sparshott KMS556 & Hohnen (BRI).

Notes: *K. lateritia* is indigenous to East Africa where it is found in Kenya and Tanzania (Raadts 1977; Wickens 1987). *K. lateritia* var. *lateritia* is infrequently cultivated in Queensland gardens and propagates both

vegetatively and from seeds. It is a localised adventive at the given locality.

Delimitation of the genera *Bryophyllum* and *Kalanchoe* has been debated for many years (Forster 1985) and some workers prefer a single, broadly circumscribed genus (Rauh 1995; Boiteau & Allorge-Boiteau 1996). The case for both to be recognised is strong (Lauzac-Marchal 1974) and the generic treatments of Toelken (1985) and Wickens (1987) are supported herein. All of the taxa lumped under the common name of 'Mother of Millions' belong to the genus *Bryophyllum* of which only *B. daigremontianum* (Raym.-Hamet & Perr.) Berger, *B. delagoense* (Eckl. & Zeyh.) Schinz (syn. *B. tubiflorum* Harv.), a hybrid of these first two species, and *B. pinnatum* (Lam.) Oken should be considered as serious established weeds. Other species of *Bryophyllum* are generally non-invasive garden or shadehouse plants and undeserving of eradication programs advocated by weed control agencies.

Sedum L.

This is the first record of this genus becoming naturalised.

3. **Sedum praealtum** A.DC., 10^{me} Not. Pl. Rar. Jard. Genève 21 (1824).

Three subspecies are recognised within *S. praealtum* (Stephenson 1994), with *S. praealtum* subsp. *praealtum* recorded here.

Specimen examined: Queensland. MORETON DISTRICT: Boyce's Quarry project, Bundamba TAFE College, Ipswich, Oct 1995, Forster PIF17878, Bird & Figg (BRI).

Notes: *S. praealtum* subsp. *praealtum* is thought to originate from Central America, probably from the tropical lowlands of Vera Cruz (Stephenson 1994). The species has been cultivated in many countries for centuries and is known to be an occasional adventive in eastern Europe (Stephenson 1994). In Australia naturalisations have been previously recorded from New South Wales and South Australia (Forster 1996b). The species is a localised adventive at the given locality.

The genera of Crassulaceae (including the native *Crassula*) in Queensland may be distinguished with the following key -

1. Stamen number equal to petal number **Crassula**
 Stamen number twice petal number 2
2. Floral parts in fours 3
 Floral parts in fives 4
3. Flowers erect; filaments fused to corolla tube at or above middle **Kalanchoe**
 Flowers pendulous; filaments fused to corolla tube in lower third **Bryophyllum**
4. Inflorescence terminal **Sedum**
 Inflorescence lateral **Graptopetalum**

EUPHORBIACEAE

Jatropha L.

Two species of *Jatropha* have been previously recognised as naturalised in Queensland, namely *J. curcas* L. and *J. gossypifolia* L. (Henderson 1994, 1997).

4. ***Jatropha podagrica*** Hook., Bot. Mag. t. 4376 (1848).

Specimen examined: Queensland, SOUTH KENNEDY DISTRICT: Keswick Island, Sep 1996, *Batianoff* 960912 & *Champion* (BRI).

Notes: *J. podagrica* is native to Mexico (Dehgan & Webster 1979) and is widely cultivated in subtropical and tropical gardens in eastern Australia. It has been recorded recently as an adventive near abandoned habitation. The species propagates only from seed.

Key to the naturalised species of *Jatropha*

1. Foliage and stems with stipitate glandular trichomes ***J. gossypifolia***
 Foliage and stems glabrous or with simple trichomes 2
2. Stipules entire; leaf lamina broadly-ovate ***J. curcas***
 Stipules multifid; leaf lamina 3–5 palmatifid or palmatipartite ***J. podagrica***

Manihot Mill.

There seems to have been some confusion as to both the identity and diversity of the naturalised taxa of *Manihot*. Stanley (1983) lists *M. esculenta* Crantz as being naturalised

in south-eastern Queensland and Henderson (1994) also lists this species for the entire State. *M. glaziovii* Muell. Arg. and *M. grahamii* Hook. also occur as naturalised species (Henderson 1997). Because of the apparent confusion, short descriptions are provided for the three species, as well as a key to distinguish them.

Key to the naturalised species of *Manihot*

1. Leaf lamina lobes broadly ovate to obovate; fruits globose ***M. glaziovii***
 Leaf lamina lobes lanceolate, oblong, oblanceolate or ovate; fruits ovoid
 or subglobose 2
2. Root tubers present; male flower sepals lanceolate- triangular; fruits ovoid,
 15–17 mm long ***M. esculenta***
 Root tubers absent; male flower sepals triangular-ovate; fruits
 subglobose, c. 14 mm long ***M. grahamii***

5. *Manihot esculenta* Crantz, Inst. Rei Herb. 1: 167 (1766).

Subshrub or shrub to 5 m high. Root tubers up to 50 cm long. Stipules lanceolate-triangular, 5–11 mm long. Leaves deeply palmatipartite, 3–7 lobed, the lobes oblanceolate to lanceolate or ovate, 5–17 cm long, 1–6 cm wide; tip acute to acuminate; base attenuate to cuneate. Male flowers: pedicels 2–7 mm long; calyx lobes lanceolate-triangular, 4–6 mm long, 2–4 mm wide, tube 4–6 mm long. Female flowers: pedicels 5–12 mm long; calyx lobes triangular-ovate 6–10 mm long, 2.5–5 mm wide. Fruits ovoid, 15–17 mm long, 14–15 mm diameter. Seeds ellipsoid, c. 11 mm long, 5.5–5.8 mm wide. *Tapioca* or *Cassava*.

Specimens examined: Queensland. COOK DISTRICT: Darnley Island, Torres Strait, 9° 35'S, 143° 46'E, Jul 1974, *Heatwole* 449 (BRI); 3.5 km SE of Weipa Mission, 12° 42'S, 141° 55'E, Jul 1974, *Specht & Salt* W324 (BRI); McDonnell Creek behind school, 17° 12'S, 145° 53'E, Dec 1993, *Forster* PIF14451 (BRI). NORTH KENNEDY DISTRICT: 1 km N of Cardwell, 18° 16'S, 146° 01'E, Apr 1975, *McDonald* 1469 & *Batianoff* (BRI).

Notes: *M. esculenta* is the species used for production of cassava and is native to tropical South America. The species is widely cultivated in the tropics and is naturalised as an adventive in a few places in northern Queensland where it is an escape from cultivation. Propagation occurs from division of the starchy root-storage tubers. It is uncertain whether the species reproduces sexually in Australia as no fertile specimens have been sighted and the population at McDonnell Creek showed no evidence of flowering or fruiting.

6. *Manihot grahamii* Hook., Icon Pl. 6: t: 530 (1843).

Subshrub or shrub to 4 m high. Root tubers absent. Stipules lanceolate, 9–15 mm long. Leaves deeply palmatipartite, 5–13 lobed, the lobes oblong to oblanceolate, 5–14 cm long, 0.9–3.5 cm wide; tip acuminate; base attenuate. Male flowers: pedicels 7–10 mm long; calyx lobes triangular-ovate, 4–10 mm long, 3–5 mm wide, tube 5–8 mm long. Female flowers: pedicels 7–9 mm long; calyx lobes triangular-ovate, 10–12 mm long, 5–5.5 mm wide, tube 1–3 mm long. Fruits subglobose, c. 14 mm long and 15 mm diameter. Seeds ellipsoid, c. 12 mm long and 8 mm wide.

Specimens examined: Queensland. DARLING DOWNS DISTRICT: Gowrie Creek, Toowoomba, Feb 1984, *Swarbrick* 7382 (BRI). MORETON DISTRICT: Chapel Hill, Jan 1981, *Pieters* JT958 (BRI); Kangaroo Point, Brisbane, Mar 1933, *White* 8649 (BRI); Enoggera Creek, The Gap, Brisbane, Nov 1993, *Forster* PIF14258 (A, BRI, K, L, MEL, QRS); Teviot Brook, Dugandan, Apr 1994, *Forster* PIF15086 (A, BRI, MEL, NSW, QRS); Kalbar, Jan 1969, *Thomas* [AQ204048] (BRI).

Notes: *M. grahamii* is native to Brasil, Argentina, Paraguay and Uruguay and is naturalised as an adventive on a small scale in south-eastern Queensland and north-eastern New South Wales. Propagation occurs from seeds. It is the most widely encountered species of *Manihot* in Australia and is often cultivated as an ornamental, although the roots do not produce starchy tubers (Rogers & Appan 1973). James & Harden (1990), in describing collections from north-eastern New South Wales, misidentified this species as *M. flabellifolia*.

7. *Manihot glaziovii* Muell.Arg. in Martius,
Fl. Bras. 11(2): 446 (1874).

Shrub or small tree to 6 m high. Root tubers absent. Stipules lanceolate, c. 5 mm long. Leaves deeply palmatipartite, 3–5 lobed, the lobes broadly ovate, obovate or obovate-lanceolate, 4–15 cm long, 2–9.5 cm wide; tip obtuse to rounded; base attenuate to rounded. Male flowers: pedicels 7–9 mm long; calyx lobes triangular, 8–9 mm long, c. 6 mm wide, tube 6–7 mm long. Female flowers: pedicels 8–15 mm long; calyx lobes lanceolate, c. 12 mm long 3.5–4 mm wide. Fruits globose, 18–20 mm long, 18–22 mm diameter. Seeds ovoid, 13–15 mm long, 9–12 mm wide.

Specimens examined: Queensland. COOK DISTRICT: foothills of Mt Bartle Frere, Aug 1984, Jago 600 (BRI, QRS). SOUTH KENNEDY DISTRICT: Finchhatton, Sep 1942, Goodchild [AQ206988] (BRI).

Notes: *M. glaziovii* is native to Brasil and is naturalised as an adventive in at least one locality in north-eastern Queensland. It is cultivated to a small extent in high rainfall areas of the Wet Tropics (R.L.Jago, pers. comm. 1994), but whether any products are harvested from the plant is uncertain as the roots are not supposed to be specialised for starch storage (Rogers & Appan 1973).

***Vernicia* Lour.**

The genus *Vernicia* is closely allied to *Aleurites* J.R.Forst. & G.Forst. and has sometimes been included in it. Airy Shaw (1966) recognised *Vernicia* as distinct and this has been supported in subsequent publications (Radcliffe-Smith 1987; James & Harden 1990; Forster 1996a). *Vernicia* is considered to comprise three species, all of which are native to Asia. The genus has not been previously recorded as naturalised in Queensland.

8. *Vernicia fordii* (Hemsl.) Airy Shaw, Kew
Bull. 20: 394 (1966).

Specimen examined: Queensland. MORETON DISTRICT: c. 9 km from Nambour on Maroochy road, Mar 1979, Zande (BRI).

Notes: *V. fordii* was introduced to Australia during the 1930s for the production of 'Tung Oil' used in waterproofing, varnishes and

lacquers with extensive plantations established in north-eastern New South Wales, south-eastern and north-eastern Queensland (Buzacott 1932; Gibb 1938; McKay 1940). Eventual replacement with synthetic substances 'sounded the death-knell' for an industry that in 1938 consumed 170,632,000 pounds weight throughout the western world (Gibb 1938).

James & Harden (1990) record *V. fordii* as naturalised in New South Wales based on specimens from the Sydney area. Stanley (1983) and Henderson (1994) did not list the species, and it is recorded here (with reservations) as being an adventive in the Nambour region of south-eastern Queensland with some large trees highly visible from the Bruce Highway. A single tree has also been sighted on the edge of a forestry plantation at Gadgarra State Forest on the Atherton Tableland (pers. obs. 1996), but this is probably a planted individual rather than an adventive. The extensive plantations established in the 1930s in the Johnston River valley in north-eastern Queensland no longer exist (R.L.Jago, pers. comm. 1996).

OLEACEAE

***Jasminum* L.**

Queensland has eight native species of *Jasminum*, but none of the exotic species cultivated in gardens have been previously listed as naturalised (Henderson 1994).

9. *Jasminum mesneyi* Hance, J. Bot. 20: 37
(1882).

Specimens examined: Queensland. BURNETT DISTRICT: Cushnie road, 1.5 km S off Proston to Wondai road, opposite Springs road, 26° 15'S, 151° 46'E, Sep 1996, Forster PIF19613 & Ryan (AD, BRI, MEL). MORETON DISTRICT: Collingwood Park, Redbank, Ipswich, Sep 1995, Bird [AQ584205] (BRI).

Notes: *J. mesneyi* (Primrose Jasmine) is native to western China and commonly grown in temperate and subtropical gardens in Europe, north America and eastern Australia. Most plants in cultivation, and undoubtedly those in Australia, are supposed to originate from live material collected near Mengzi, southern Yunnan by E.H.Wilson in 1899 (Lancaster

1989). In Queensland it has occasionally become established as an adventive where garden rubbish is deposited and appears to propagate by suckering. Wilson's original collection (with the double corolla) supposedly did not propagate from seed although subsequent collections by Lancaster (with mainly single corollas) bore seed (Lancaster 1989).

POLYGONACEAE

Persicaria (L.) Miller

There are eleven native species of *Persicaria* recorded for Queensland, but no naturalised ones (Henderson 1994, 1997). The following species is recorded as naturalised in New South Wales (Wilson 1990).

10. *Persicaria capitata* (Buch.-Ham. ex D.Don) H.Gross, Bot. Jahrb. Syst. 49: 277 (1913).

Specimen examined: Queensland, MORETON DISTRICT: Springbrook, Goomoolahra Falls, Warrie N.P., 28° 13'S, 153° 17'E, Oct 1996, *Forster* PIF19835 & *Leiper* (BRI, NSW).

Notes: *P. capitata* is native to Asia and is commonly grown in subtropical gardens as a ground cover. At Goomoolahra Falls, the species forms extensive, dense mats on natural rock faces and is displacing native vegetation. Propagation appears to be by vegetative layering.

Orthography of the family name Aloaceae

In the 'Flora of Australia' the classification system of Cronquist (1981) is followed wherein the monocot family Aloeaceae is recognised. An excellent case for the familial spelling to be Aloaceae has been presented by Smith (1993) and has now been accepted for standard floras and guides in regions where the family is native (e.g. Carter 1994; Van Wyk & Smith 1996).

Aloe maculata versus *A. saponaria* (Aloaceae)

In the 'Flora of Australia' account of *Aloe*, *A. saponaria* (Ait.) Haw. is treated as being naturalised in Queensland (Forster & Clifford 1986). *A. saponaria* var. *ficksbergensis* G.Reyn. has subsequently been found naturalised in one locality in Queensland (Forster 1988). The name *A. saponaria* is now considered to be misapplied to this species and the name *A. maculata* All. is preferred (Glen & Smith 1995; Van Wyk & Smith 1996). Despite *A. saponaria* var. *ficksbergensis* being a well defined entity, Van Wyk & Smith (1996) do not recognise it and its status is uncertain at this point.

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References

- AIRY SHAW, H.K. (1966). Notes on Malaysian and other Asiatic Euphorbiaceae. *Kew Bulletin* 20: 379–415.
- BOITEAU, P. & ALLORGE-BOITEAU, L. (1995). *Kalanchoe* (Crassulacée) de Madagascar. *Systématique, ecophysiologie et phytochimie*. Paris: Karthala.
- BUZACOTT, W.S. (1932). Tung Oil. Age-old product essential to modern industry. *Commercial Australia* 12th October 1932.
- CARTER, S. (1994). Aloaceae. In R.M.Phill (ed.), *Flora of Tropical East Africa*. Rotterdam/Boston: A.A.Balkema.
- CRONQUIST, A. (1981). *An Integrated System of Classification of Flowering Plants*. New York: Columbia University Press.

- DEHGAN, B. & WEBSTER, G.L. (1979). Morphology and infrageneric relationships of the genus *Jatropha* (Euphorbiaceae). *University of California Publications in Botany* 74: 1-73.
- FORSTER, P.I. (1985). The genera *Kalanchoe* and *Bryophyllum* in cultivation. *Anacampseros* 1: 37-41, 52-56; 2: 4-8.
- (1988). Notes on the naturalised flora of Queensland. *Austrobaileya* 2: 573-576.
- (1996a). A taxonomic revision of *Aleurites* J.R.Forst. & G.Forst. (Euphorbiaceae) in Australia and New Guinea. *Muelleria* 9: 5-13.
- (1996b). Naturalized succulents in the Australian flora. *Haseltonia* 4: 57-65.
- FORSTER, P.I. & CLIFFORD, H.T. (1986). Aloeaceae. In A.S.George (ed.), *Flora of Australia* 46: 66-70. Canberra: Australian Government Publishing Service.
- GIBB, J. (1938). Tung-oil. A new Australian primary product. *Walkabout* July 1st 1938, pp. 38-40.
- GLEN, H.F. & SMITH, G.F. (1995). Notes on the typification of some species of *Aloe* (Asphodelaceae/Aloeaceae). *Bothalia* 25: 37- 42.
- HENDERSON, R.J.F. (ed.) (1994). *Queensland Vascular Plants: Names and Distribution*. Brisbane: Queensland Department of Environment & Heritage.
- (ed.) (1997). *Queensland Plants: Names and Distribution*. Brisbane: Department of Environment.
- JAMES, T.A. & HARDEN, G.J. (1990). Euphorbiaceae. In G.J.Harden (ed.), *Flora of New South Wales* Vol. 1: 389-430. Kensington (Sydney): University of New South Wales Press.
- JOHNSON, R.W. (1995). The aliens have landed: an account of the development of the naturalised flora of Queensland. *Proceedings of the Royal Society of Queensland* 105: 5-17.
- KIMNACH, M. & MORAN, R. (1986). *Graptopetalum paraguayense*: a history and a new subspecies. *Cactus & Succulent Journal (Los Angeles)* 58: 48-56.
- KLOOT, P.M. (1987). The naturalised flora of South Australia. I. The documentation of its development. *Journal of the Adelaide Botanic Gardens* 10: 81-90.
- LANCASTER, R. (1989). *Travels in China - a plantsman's paradise*. Woodbridge (U.K.): Antique Collectors' Club.
- LAUZAC-MARCHAL, M. (1974). Rehabilitation du genre *Bryophyllum* Salisb. (Crassulacées Kalanchoidées). *C.R. Acad. Sc. Paris* 278, ser.D: 2505-2508.
- McKAY, H.C. (1940). Pirates and the dinkum oil. *Smith's Weekly* April 27.
- RAADTS, E. (1977). The genus *Kalanchoe* (Crassulaceae) in East Africa. *Willdenowia* 8: 101-157.
- RADCLIFFE-SMITH, A. (1987). Euphorbiaceae, Part 1. In R.M.Polhill (ed.), *Flora of Tropical East Africa*. Rotterdam/Boston: A.A.Balkema.
- RAUH, W. (1995). *Succulent and Xerophytic Plants of Madagascar*. Volume 1. Mill Valley: Strawberry Press.
- ROGERS, D.J. & APPAN, S.G. (1973). *Manihot* and *Manihotoides* (Euphorbiaceae) a computer-assisted study. *Flora Neotropica Monographs* No. 13:1-272.
- SMITH, G.F. (1993). Familial orthography: Aloeaceae vs. Aloaceae. *Taxon* 42: 87-90.
- STANLEY, T.D. (1983). Euphorbiaceae. In T.D.Stanley & E.M.Ross (eds.), *Flora of South-eastern Queensland* Vol. 1: 406-439. Brisbane: Queensland Department of Primary Industries.
- STEPHENSON, R. (1994). *Sedum - cultivated stonecrops*. Portland (U.S.A.): Timber Press.
- TOELKEN, H.R. (1985). Crassulaceae. In O.A.Leistner (ed.), *Flora of Southern Africa* Vol. 14: 1-244. Pretoria: Department of Agriculture and Water Supply.
- VAN WYK, B.-E. & SMITH, G.F. (1996). *Guide to the Aloes of South Africa*. Pretoria: Briza Publications.
- WICKENS, G.F. (1987). Crassulaceae. In R.M.Polhill (ed.), *Flora of Tropical East Africa*. Rotterdam/Boston: A.A.Balkema.
- WILSON, K.L. (1990). Polygonaceae. In G.J.Harden (ed.), *Flora of New South Wales* Vol. 1: 278-293. Kensington (Sydney): University of New South Wales Press.

A new combination in *Dendrocnide* (Urticaceae) in north Queensland

B.R. Jackes¹ and M. Hurley²

Summary

Jackes, B.R. & Hurley, M. (1997). A new combination in *Dendrocnide* (Urticaceae) in north Queensland. *Austrobaileya* 5(1): 121–123. *Laportea cordifolia* L.S.Sm. from the Atherton Tableland is reinstated as *Dendrocnide cordifolia* (L.S.Sm.) Jackes & Hurley. *Dendrocnide cordata* (Warb. ex H.J.Winkl.) Chew is recognised as a separate species occurring on northern Cape York Peninsula. A key to the Australian species of *Dendrocnide* is provided.

Keywords: *Urticaceae*, *Dendrocnide*, *Dendrocnide cordata*, *Dendrocnide cordifolia*, *Laportea cordifolia*.

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Introduction

A study of herbivory (M.Hurley) on several populations of *Dendrocnide* species occurring on the Atherton Tableland, north Queensland, indicated that not all the names currently in use for this genus could be applied with confidence. According to the *Flora of Australia* treatment by Chew (1989), the following species occur in this area; *Dendrocnide cordata* (Warb. ex H.J.Winkl.) Chew, *D. moroides* (Wedd.) Chew and *D. photinophylla* (Kunth) Chew. Chew (1969, p58) included *Laportea cordifolia* L.S.Sm. (as *L. cordatifolia*) under *Dendrocnide cordata*. Seeds were collected from the different taxa of *Dendrocnide* occurring in the Wongabel State Forest, approximately 6 km SW of Atherton (17° 17'S, 145° 28'E) and grown to maturity in a shadehouse at the James Cook University of North Queensland campus. Flowering and fruiting material was then compared with herbarium specimens.

The type of *L. cordata* was collected in the lowland area of the Sepik River at Constantinhafen (*Hollrung* 513; BO, K, MEL), whilst the type of *L. cordifolia* was collected near Atherton at an altitude of 1000 m

(3600 ft.) (*Smith* 10132; BRI). An examination of specimens held in the Queensland Herbarium (BRI) and Atherton (QRS) indicated that the taxon represented by *Hollrung* 513 occurs only in lowland situations. A specimen collected from the West Claudie River, 10.3 km WNW of Lockhart River Vacant Crown Land (AQ 631774) is the only Australian specimen seen which appears similar to the type of *L. cordata*. *L. cordifolia* appears to occur only on the Atherton Tableland. Smith (1959) stated that "It [*L. cordata*] differs [from *L. cordifolia*] in being a large tree with less compressed fruits and 5-nerved leaves which are more hairy beneath"; however, an examination of both herbarium material and the types of both names has shown that the two taxa may be distinguished from each other by a number of characters, not least being the structure of the inflorescence (Table 1). Hence we propose that *L. cordifolia* should be reinstated with a new combination under the genus *Dendrocnide*. In the course of this study, a number of variant populations of *D. moroides* were also recognised and this variation was confirmed by a study of herbarium specimens; however, further collections need to be made and studied, including breeding studies, before any groups can be formally recognised.

Taxonomy

Dendrocnide cordifolia (L.S.Sm.) B.R.Jackes
& M.Hurley, **comb. nov.**

Laportea cordifolia L.S.Sm., Proc. Roy.
Soc. Queensland 70:31 (1959). **Type:**
c. 4 miles (6.4 km) SW of Atherton, Qld.,
4 September 1957, *L.S.Smith* 10132
(holo: BRI [AQ24367]).

Selected specimens: COOK DISTRICT: S.F.R. 185 Danbulla,
Emu L.A., Sep 1992, *Hyland* 14553 (QRS); S.F.R.
198, Crater area, Jan 1982, *Stocker* 1796 (QRS).

All inflorescences examined were monoecious, although the male flower which terminated the first division of the dichasium often aborted leaving a small scar. At maturity the pedicellate male flower was held above the lateral branches bearing the female flowers. It was noted that the anthers dehiscid explosively. In response to changes in moisture levels the 3 mm long staminal filament uncoiled from under the hooded tepal, the anther thecae split and pollen was released over everything in the vicinity. The short filament (<1 mm long) in *D. moroides* as well as the short pedicel (av. 0.25 – 0.5 mm long), which results in the male flower not being held above the female flowers at maturity, suggests that such a mechanism does not operate in this species.

Conservation status: This species is not considered threatened.

Dendrocnide cordata (Warb. ex H.J.Winkl.)
Chew. **Type:** Sepik River, New Guinea,
K.Hollrung 513 (iso: BO, K, MEL [MEL
8911])

Australian specimen seen: COOK DISTRICT: West Claudie
River, 10.3 km WNW of Lockhart River Vacant Crown
Land, Mar 1994, *Fell* DGF4155, *Stanton & Claudie* (BRI
[AQ631774]).

No scars representing the abscission of the male flowers were apparent on the *Fell* et al. specimen which suggests that the inflorescence is dioecious. The inflorescence is quite open and similar to that illustrated by Chew (1969, p59) for *D. cordata*. Unfortunately no descriptions of the fruit colour have as yet been recorded in the literature but field notes associated with two collections from Kanosia (Papua New Guinea) held at Kew record the fruit as white (*Darbyshire* 629 and *Carr* 11207). The Australian specimen differs from the type in that its leaf is not prominently 5-veined at the base and although the serrations on the margin are irregular on some leaves, they are not as marked as on the type.

Conservation status: Insufficiently known.

Table 1. Comparison of morphological charcters for *Dendrocnide cordata*, *D. cordifolia* and *D. moroides*.

Character	<i>D. cordata</i>	<i>D. cordifolia</i>	<i>D. moroides</i>
margin	irregularly dentate	dentate/ denticulate	dentate/ denticulate
base	cordate	cordate	peltate
colour of fruit	white	greenish/ white	red/ purple
inflorescence	open	compact	open
sexuality of inflorescence	dioecious	monoecious	monoecious rarely dioecious
length of inflorescence	5– 6 cm	2–2.25 cm	5 – 15 cm
stipules	1.5–2 mm	1–1.5 mm	1 mm
achenes	2 × 1.5 mm	1.6 × 1.2 mm	2 × 1.5 mm

NB. Inflorescence measurements taken as far as could be ascertained at a similar stage of maturity.

Key to the Australian species of *Dendrocnide* (modified from Chew, 1989)

1. Leaves glabrous or with hairs on veins on lower surface only 2
 Leaves hairy on both surfaces 3
2. Leaf blade narrowly elliptic; base strongly cuneate; apex acuminate to
 attenuate; hairs, if present, confined to midrib on the lower surface of the
 leaf blade **D. corallodesme**
 Leaf blade elliptic to ovate, base broadly cuneate to rounded; apex
 shortly acuminate **D. photinophylla**
3. Leaves peltate **D. moroides**
 Leaves not peltate 4
4. Inflorescence monoecious, compact; leaf margins regularly dentate/
 denticulate. **D. cordifolia**
 Inflorescence dioecious, open; leaf margins various but not regularly dentate/
 denticulate. 5
5. Leaf blade usually densely woolly on the lower surface but sometimes
 restricted to the sinuses; basal lobes usually overlapping. **D. excelsa**
 Leaf blade not densely woolly on lower surface; basal lobes not overlapping
 **D. cordata**

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References

- CHEW W.L. (1969). A monograph of *Dendrocnide* (Urticaceae). *Gardens Bulletin Singapore*. 25:1–104.
- (1989). *Urticaceae*. In A.S. George (exec.ed.). *Flora of Australia*. 3:73–79. Canberra: Australian Government Publishing Service.
- SMITH L.S. (1959). *Urticaceae*. In 'New Species of and Notes on Queensland Plants' IV. *Proceedings of the Royal Society of Queensland* 70 (5):31–32.

Notes on *Eucalyptus* ser. *Psathyroxyla* Blakely (Myrtaceae) and other 'Ash group' eucalypts

A.R. Bean

Summary

Bean, A.R. (1997). Notes on *Eucalyptus* ser. *Psathyroxyla* Blakely (Myrtaceae) and other 'Ash group' eucalypts. *Austrobaileya* 5(1): 125–135. A key to the species of the New England Blackbutts and Scribbly Gums (*E.* ser. *Psathyroxyla* Blakely) of south-eastern Australia is provided. The new species *Eucalyptus montivaga* A.R.Bean is described and illustrated. The species related to *E. montivaga* are described and their distributions mapped. *E. microcodon* L.A.S.Johnson & K.D.Hill is reduced to synonymy with *E. codonocarpa* Blakely & McKie.

Keywords: *Eucalyptus*, *Eucalyptus andrewsii*, *Eucalyptus campanulata*, *Eucalyptus racemosa*, *Eucalyptus montivaga*, *Eucalyptus microcodon*, Myrtaceae, Ash group, Scribbly Gums.

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Introduction

The Ash group of *Eucalyptus* was accurately defined by Pryor and Johnson (1971), as informal *E.* series *Obliquae* L.D.Pryor & L.A.S.Johnson. The group is characterised by buds with a single operculum and inflexed or irregularly flexed stamens, and seedlings in which the leaves are opposite for only a few pairs, then falcate and pendulous (Brooker 1977). Brooker proposed two groups of Ashes, which have become known as 'Blue Ashes' and 'Green Ashes'. These are considered to be monophyletic groups (Ladiges et al. (1989,1992). Ash-eucalypt species are found in coastal and near-coastal areas of south-eastern Australia, from near Mackay in Queensland to Tasmania, and as far west as Kangaroo Island in South Australia. Greatest species diversity is found in central to southern New South Wales, where a number of restricted endemics are located.

Eucalyptus ser. *Psathyroxyla* Blakely originally included only the 'Scribbly Gums', but was expanded by Chippendale (1988) to include the related New England Blackbutts and Silvertop Ashes.

The 'New England Blackbutts' of north-eastern New South Wales include the long-standing species *E. andrewsii* Maiden and

E. campanulata R.T.Baker & H.G.Sm., and the recently named *E. olida* L.A.S.Johnson & K.D.Hill. A fourth New England Blackbutt, *E. montivaga* sp. nov., is relatively widespread (though very sporadically distributed) in mountainous areas from Toowoomba to Eungella. In recent years, it has been variously identified as *E. andrewsii*, *E. andrewsii* subsp. *andrewsii* (Chippendale 1988), *E. andrewsii* subsp. *campanulata* (Johnson & Blaxell 1973), or an intergrade between the latter two taxa (Boland et al. 1984).

The Mallee-ashes of the Green Ash group (informal *E.* subseries *Strictinae* L.D.Pryor & L.A.S.Johnson) are taxonomically difficult. Three taxa have been named from northern New South Wales and Queensland: *E. approximans* Maiden was named from Barren Mountain (near Dorrigo) in 1919. *E. codonocarpa* Blakely & McKie was named from Pheasant Mtn (near Guyra) in 1930. More recently, *E. microcodon* L.A.S.Johnson & K.D.Hill was named from Mt Barney (in far southern Queensland) in 1991. The identity of the MacPherson Range/Mt Barney mallees, and the rank and circumscription of '*codonocarpa*' have been contentious issues for some years.

The term 'floral cavity' is used to describe the space between the base of the style and the underside of the distal part of the operculum in *Eucalyptus* spp.

Taxonomy

Eucalyptus ser. **Psathyroxyla** Blakely, Key
Eucalypts 52 (1934). **Type:**
E. haemastoma Sm. (lecto, fide
Chippendale (1988)).

Eucalyptus subser. *Considenianae* Brooker
& Slee, Muelleria 9: 84 (1996). **Type:**
E. consideniana Maiden

Key to the species of *Eucalyptus* ser. *Psathyroxyla*

1. Mallees 2
Trees 3
2. Adult leaves 0.7–1.2 cm wide; fruit pyriform to campanulate **3. *E. multicaulis***
Adult leaves 1.5–3.5 cm wide; fruit obconical to hemispherical **1. *E. remota***
3. Bark smooth throughout and marked by insect “scribbles” 4
Bark rough, persistent, at least on the trunk 6
4. Adult leaves 1.0–1.6 cm wide, juvenile leaves broadly lanceolate **11. *E. rossii***
Adult leaves 1.3–2.6 cm wide, juvenile leaves broadly ovate 5
5. Fruits 4–5 mm long **9. *E. racemosa***
Fruits 6.5–9 mm long **10. *E. haemastoma***
6. Bark on trunk dark grey to black, furrowed **2. *E. sieberi***
Bark on trunk light grey, not furrowed 7
7. Bark with prickly fibres, persistent to small branches **4. *E. consideniana***
Bark without prickly fibres; smooth bark on small and medium sized
branches 8
8. Branchlets usually glaucous; fruits hemispherical, inflorescence
9–13-flowered; operculum conspicuously umbonate **5. *E. andrewsii***
Branchlets not glaucous; fruits obconical, campanulate or hemispherical;
inflorescence 7–17-flowered; operculum minutely umbonate 9
9. Fruits obconical or campanulate, 5.0–8.0 × 4.5–7.0 mm; staminodes rare
or absent 10
Fruits hemispherical, 4.0–6.0 × 4.5–6.0 mm; staminodes consistently
present **8. *E. montivaga***
10. Style short, c. 1 mm long; fruits 5.0–7.0 × 4.5–5.5 mm; juvenile leaves
broadly ovate **6. *E. campanulata***
Style long, c. 2.5 mm long; fruits 5.0–8.0 × 5.0–7.0 mm; juvenile leaves
ovate **7. *E. olida***

1. ***Eucalyptus remota*** Blakely, Key Eucalypts 197 (1934). **Type:** South Australia, near Mt Taylor, Kangaroo Island, June 1907, *W. Gill* s.n. (holo: NSW n.v., fide Chippendale (1988)).

Distribution and habitat: *E. remota* is endemic to the western half of Kangaroo Island in South Australia, where it grows in mallee scrub on sandy or lateritised soils.

2. ***Eucalyptus sieberi*** L.A.S. Johnson, Contr. New South Wales Natl. Herb. 3: 125 (1962). **Type:** New South Wales. CENTRAL TABLELANDS: Blackheath, April 1899, *J.H. Maiden* (holo: NSW n.v., fide Chippendale (1988)).

Distribution and habitat: *E. sieberi* extends from Wyong in New South Wales to near Melbourne, and in north-eastern Tasmania. It grows in woodland or forest at low to intermediate altitudes, on coarse textured soils.

3. ***Eucalyptus multicaulis*** Blakely, J. & Proc. Roy. Soc. New South Wales 61: 172 (1927). **Type:** New South Wales. Kariong Trig, September 1925, *W.F. Blakely*, *D.W.C. Shireess* & *H. Bott* (holo: NSW n.v., fide Chippendale (1988)).

Distribution and habitat: *E. multicaulis* is of restricted distribution, including Blue Mountains, east of Rylstone and the Budawang Range. It occurs on broad ridge-tops in sandstone areas, on shallow or skeletal soils.

4. ***Eucalyptus consideniana*** Maiden, Proc. Linn. Soc. New South Wales 2nd ser., 29: 475 (1904). **Type:** numerous syntypes held at NSW n.v., fide Chippendale (1988).

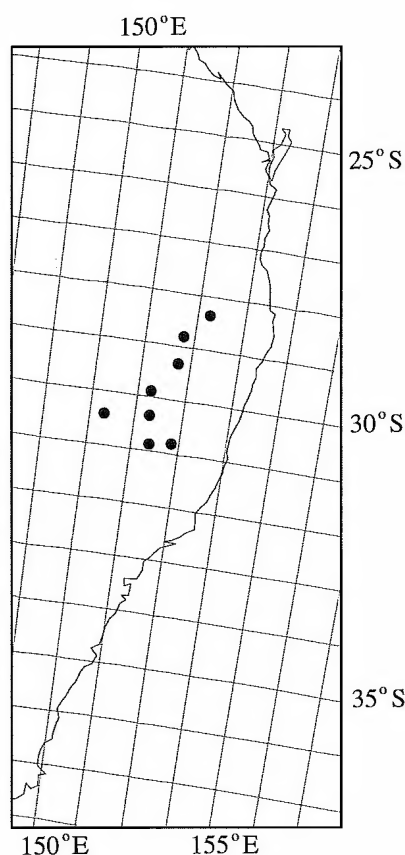
Distribution and habitat: *E. consideniana* extends from near Sydney almost to Melbourne, usually close to the coast, on poor sandy soils.

5. ***Eucalyptus andrewsii*** Maiden, Proc. Linn. Soc. New South Wales, 2nd ser., 29: 472 (1904). **Type:** New South Wales. NORTHERN TABLELANDS: Tingha, 16 October 1903, *R.H. Cambage* s.n. (lecto: (here designated) NSW [NSW 335599]).

Tree to 25 m tall. Bark on trunk and larger branches rough, persistent, finely fibrous, grey; small branches smooth, grey or white; branchlets usually glaucous. Lignotuber present. Seedling leaves opposite for c. 8 pairs. Petioles (3rd pair) c. 4 mm long. Juvenile leaves alternate, petiolate, broadly ovate, falcate, twisted vertically, apex acute. Adult leaves alternate, petiolate, lanceolate, 10–14 × 1.7–2.4 cm, acuminate, oblique, concolorous, bluish-green; lateral veins widely spaced, at c. 30–40° to midrib, reticulation sparse, intramarginal vein distinct, c. 1 mm from margin, oil gland density unknown, glands of various sizes, many per areole. Inflorescence simple, axillary; umbellasters 9–13 flowered; peduncles terete, 7–20 mm long; pedicels 2.0–5.5 mm long. Mature buds clavate, c. 4 × 3 mm. Operculum single, hemispherical, conspicuously umbonate. Filaments inflexed, anthers versatile, reniform, dehiscing by confluent slits, staminodes absent or rarely present. Floral cavity c. 2.5 mm long. Style c. 1.0 mm long at anthesis; stigma blunt. Fruit hemispherical, 6.0–6.5 mm long, 6.0–8.0 mm diameter, 4(5)-locular, disc forming a broad rim, level or slightly raised; valves at rim level. Seeds cuboid or pyramidal, brown-black, chaff similar but paler.

Selected specimens: **Queensland.** DARLING DOWNS DISTRICT: Hellhole Gorge, NE of Yangan, Oct 1996, *Bean* 10932 (BRI, CANB); Wyberba, hilltop among rocks, Jan 1933, *Blake* 4570 (BRI); Thulimbah, Jul 1958, *Blake* 20403 (BRI, NSW); Dalveen, Nov 1976, *Clarkson* 309 & *Byrnes* (BRI); Cottonvale, Sep 1954, *Devereux* s.n. (BRI); just W of Glen Aplin, Nov 1946, *Everist* & *Webb* 1374 (BRI); at Mt Norman walking track entrance, Mt Norman–Wallangarra road, Girraween NP, Jun 1994, *Grimshaw* G758 & *Halford* (BRI, NSW); Fletcher, Oct 1933, *White* 9392 (BRI). **New South Wales.** NORTHERN TABLELANDS: Silent Grove–Torrington road, 14.1 km N of Torrington, Jan 1995, *Bean* 8251 (BRI, NSW); 5.2 km from McDonald River crossing on Uralla Rd., Sep 1992, *Brooker* 11178 (BRI, CANB, NSW); 23.7 km NNW Armidale towards Bundarra, Apr 1975, *Chippendale* GC1252 & *Brennan* (BRI, CANB); 2.7 km E along the Flagstone Creek track from the Gulf Road, c. 18 km (direct) just W of N of Emmaville, Oct 1990, *Coveny* 14639 et al. (BRI, NSW); 5 km E of Mt Lindsay on Barraba fire trail, Aug 1986, *Hill* 2112 (BRI, CANB, NSW); Borrolong, 18 miles [29 km] SW of Guyra, Oct 1928, *McKie* s.n. (BRI).

Distribution and habitat: *E. andrewsii* is widespread on the western parts of the New England Tableland, mostly in New South Wales, but extending to Queensland on the 'Granite Belt' around Stanthorpe, and at Hellhole Gorge near Yangan (Map 1). It grows on infertile siliceous soils on hills and mountains.



Map 1. Distribution of *E. andrewsii*.

Phenology: Flowers are recorded from December to February.

Notes: Maiden did not choose a lectotype for *E. andrewsii* in his 'Critical Revision of the Genus Eucalyptus', as was asserted by Chippendale (1988).

6. Eucalyptus campanulata R.T.Baker & H.G.Sm., J. & Proc. Roy. Soc. New South Wales 45: 288 (1912); *E. andrewsii* subsp. *campanulata* (R.T.Baker

& H.G.Sm.) L.A.S.Johnson & Blaxell, Contr. New South Wales Natl. Herb. 4: 381 (1973). **Type:** New South Wales. Northern TABLELANDS: Tenterfield, December 1909, C.F. Laserson s.n. (holo: NSW; iso: NSW).

Tree to 35 m tall. Bark on trunk and larger branches rough, persistent, finely fibrous, grey; small branches smooth, grey or white; branchlets not glaucous. Lignotuber present. Seedling leaves opposite for c. 8 pairs. Petioles (3rd pair) c. 4 mm long. Juvenile leaves alternate, petiolate, broadly ovate, falcate, twisted vertically, apex acute. Adult leaves alternate, petiolate, lanceolate, 10–13 × 1.1–1.8 cm, acuminate, oblique, concolorous, bluish-green; lateral veins widely spaced, at c. 30–40° to midrib, reticulation sparse, intramarginal vein distinct, c. 0.5–1.0 mm from margin, oil glands numerous, 450–600/square cm, of various sizes, many per areole. Inflorescence simple, axillary; umbellasters 9–17-flowered; peduncles terete, 8–18 mm long; pedicels 4–6 mm long. Mature buds clavate, c. 4 × 3 mm. Operculum single, hemispherical, minutely umbonate. Filaments inflexed, anthers versatile, reniform, dehiscing by confluent slits, staminodes absent or rarely present. Floral cavity c. 2.0 mm long. c. 1 mm long at anthesis; stigma blunt. Fruit campanulate to obconical, 5.0–7.0 mm long, 4.5–5.5 mm diameter, 4(5)-locular, disc forming a broad-rim, level or slightly concave; valves slightly enclosed. Seeds cuboid or pyramidal, brown-black, chaff similar but paler.

Selected specimens: **Queensland.** DARLING DOWNS DISTRICT: The Steamers, E of Emu Vale, May 1990, *Bean* 1556 (BRI); c. 1 km ENE of Gambubal Forest station, E of Warwick, Oct 1996, *Bean* 10969 (BRI, CANB); 9 miles [14 km] E of Wyberba on road to Eukey, Oct 1970, *Fisher* 224 (BRI); Mt Huntley, Oct 1992, *Forster* PIF11820 et al. (BRI); Wilsons Peak, May 1938, *Goy & Smith* 405 (BRI). **MORETON DISTRICT:** upper slopes of Mt Bangalora, SW of Boonah, May 1990, *Bean* 1561 (BRI); Mt Ernest, SW of Rathdowney, Apr 1993, *Bean* 6030 (BRI); Mt Barney, Aug 1936, *Goy* 130 (BRI); Mt Maroon, Aug 1964, *Smith* 12143 (BRI); on Dave's Creek track, Lamington NP, Sep 1952, *Blake* 19071 (BRI, NSW); Springbrook, Sep 1929, *White* 6245 (BRI); Mt Castle, Laidley valley, Mar 1936, *White* 10352 (BRI). **New South Wales.** NORTHERN TABLELANDS: North Obelisk, Oct 1990, *Bean* 2494 (BRI, NSW); Guy Fawkes, Mar 1914, *Boorman* s.n. (BRI); near

Jeogla, Feb 1973, *Brooker* 3913 (BRI); 26.1 km SE of Apsley Falls turn off on Oxley Highway, Apr 1975, *Chippendale* GC1259 & *Brennan* (BRI, CANB); 0.6 miles [1.0 km] S of Liston, Jun 1968, *Johnston & Chippendale* 605 (BRI, CANB); Mt Royal, 25 miles [40 km] E of Aberdeen, Mar 1960, *Story* 7183 (BRI, NSW); Nundle, Jul 1913, *Swain* s.n. (BRI); Dorrig S.F., on high hills above Briggsdale, Oct 1930, *White* 7525 (BRI).

Distribution and habitat: *E. campanulata* is widespread on the eastern parts of the New England Tableland, and on Barrington Tops. In Queensland, it is mainly confined to the McPherson Range and Main Range, with minor occurrences to the south-east of Stanthorpe (Map 2). It grows as a component of tall wet sclerophyll forest, on sandy to loamy soils, on hills and tablelands.

Phenology: Flowers are recorded for October and November.

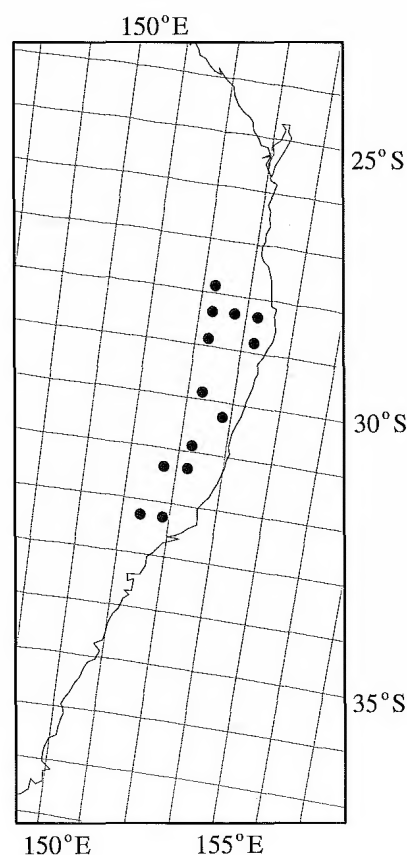
7. *Eucalyptus olida* L.A.S. Johnson & K.D. Hill, *Telopea* 4: 103 (1990). **Type:** New South Wales. NORTHERN TABLELANDS: 4.2 km from the Gwydir Highway on the north-west fire trail, Gibraltar Range N.P., 10 September 1985, *K.D. Hill* 1276 & *L. Johnson* (holo: NSW; iso: CANB, MEL).

Tree to 30 m tall. Bark on trunk and larger branches rough, persistent, flaky-fibrous, grey; small branches smooth, grey or white; branchlets not glaucous. Lignotuber present. Seedling leaves opposite for several pairs. Petioles (3rd pair) of unknown length. Juvenile leaves alternate, petiolate, broadly ovate, falcate, twisted vertically, apex acute. Adult leaves alternate, petiolate, lanceolate, 9–16 × 1.0–2.7 cm, acuminate, oblique, concolorous, bluish-green; lateral veins widely spaced, at c. 30–40° to midrib, reticulation sparse, intramarginal vein distinct, c. 1 mm from margin, oil glands of various sizes, many per areole. Inflorescence simple, axillary; umbellasters 7–11 - flowered; peduncles terete, 10–19 mm long; pedicels 3–5 mm long. Mature buds clavate, c. 4 × 3 mm. Operculum single, hemispherical, minutely umbonate. Filaments inflexed, anthers versatile, reniform, dehiscing by confluent slits, staminodes absent. Floral cavity c. 2.5 mm long. Style c. 2.5 mm long at anthesis, as long as floral cavity; stigma blunt. Fruit campanulate to obconical, 5–8 mm long,

5–7 mm diameter, 4(5) - locular, disc forming a broad rim, level or slightly concave; valves at rim level. Seeds cuboid or pyramidal, brown-black, chaff similar but paler.

Specimens examined: New South Wales. NORTHERN TABLELANDS: entrance to Waratah Trig track from Gwydir Hwy, Gibraltar Range N.P., Nov 1990, *Brooker* 10594 (BRI, CANB); 4.2 km from highway on W end of north-west fire trail, Gibraltar Range N.P., Sep 1985, *Hill* 1277 & *Johnson* (BRI); Gibraltar Range NP, Grassy Creek 4WD track, Sep 1985, *Williams* et al. NRAC4 (BRI, NSW); Poverty Point Rd, 25 km off Tenterfield–Casino road, Dec 1986, *Williams* s.n. (BRI, NSW); 4 km NW of Surface Hill by road, Oct 1984, *Wood* 12a (BRI, NSW).

Distribution and habitat: *E. olida* is known from two areas of northern New South Wales; the Poverty Point area east of Tenterfield, and the Gibraltar Range, between Glen Innes and Grafton (Map 4). It grows in woodland or open forest on infertile sandy soils.



Map 2. Distribution of *E. campanulata*.

Phenology: Flowers have been recorded in January.

Notes: *E. olida* is very similar in appearance to *E. campanulata* and *E. andrewsii*, but differs fundamentally from those species by its long style which extends the full length of the floral cavity. *E. campanulata*, *E. andrewsii*, *E. montivaga* and the ‘Scribbly Gums’ all have short styles, which extend only halfway (or less) across the floral cavity. Despite this, I feel that *E. olida* is best placed within *E. ser. Psathyroxyla*.

Hill (1991) stated that *E. olida* has “outer stamens infertile” (p. 139) and “outer stamens often infertile” (p. 140). This is in stark contrast to Johnson & Hill (1990), where it is stated that “anthers” are “all fertile” in *E. olida*. The present author’s observations support the latter view, i.e. that the stamens are all fertile.

8. *Eucalyptus montivaga* A.R.Bean sp. nov.

affinis *E. racemosae* et *E. campanulatae*; ab illa cortice scabra fibrosa et pedicellis longioribus, ab hac fructibus hemisphaericis (non obconicis usque campanulatis) instructis valvis aequantibus labrum hypanthii (non inclusis inter idi) et staminodiis semper praesentibus differt. **Typus:** Queensland. BURNETT DISTRICT: 5 km SE of Gallangowan, 11 September 1996, A.R. Bean 10692 (holo: BRI; iso: CANB, MEL, NE, NSW, distribuendi).

Eucalyptus haemastoma var. *inophloia*

C.T.White, Queensland Agric. J. 2nd ser. 14: 70 (1920). **Type:** Queensland. DARLING DOWNS DISTRICT: Toowoomba, in 1919, C.T.White s.n. (syntypes at BRI).

Tree to 30 m tall. Bark on trunk and larger branches rough, persistent, finely fibrous, grey; small branches smooth, grey or white; branchlets not glaucous. Lignotuber present. Seedling leaves opposite for c. 7 pairs. Petioles (3rd pair) c. 2 mm long. Juvenile leaves alternate, petiolate, broadly ovate, 100–140 × 32–55 mm, falcate, twisted vertically, apex acute. Adult leaves alternate, petiolate, lanceolate, 9–16.5 × 1.1–1.9 cm, acuminate, oblique, concolorous, bluish-green; lateral

veins widely spaced, at c. 30–40° to midrib, reticulation sparse, intramarginal vein distinct, c. 1 mm from margin, oil glands numerous, 450–650/square cm, of various sizes, many per areole. Inflorescence simple, axillary; umbellasters 11–17-flowered; peduncles terete, 8–14 mm long; pedicels 3.5–5.5 mm long. Mature buds clavate, c. 4 × 3 mm. Operculum single, hemispherical, minutely umbonate. Filaments inflexed, anthers versatile, reniform, dehiscing by confluent slits, staminodes present amongst outer whorls of all flowers. Floral cavity c. 2.0 mm long. Style c. 1.0 mm long at anthesis; stigma blunt. Fruit hemispherical, 4.0–6.0 mm long, 4.5–6.0 mm diameter, 4(5)-locular, disc forming a broad rim, level or slightly convex; valves at rim level. Seeds cuboid or pyramidal, brown-black, chaff similar but paler. Fig. 1.

Selected specimens: Queensland. SOUTH KENNEDY DISTRICT: Dicks Tableland, Eungella N.P., Sep 1991, *Bean* 3668 (BRI); Swampy Ridge, W of Eungella township, May 1992, *Bean* 4452 (BRI, CANB); Dalrymple Heights, Mackay, Feb 1957, *Hickey* 57/220 (BRI); N of Crediton, 6 miles [10 km] W of Eungella, Jan 1957, *Muir* 57/111 (BRI). PORT CURTIS DISTRICT: summit of Mt Stanley, Many Peaks Range, Feb 1988, *Bean* 745 (BRI); Kroombit Tops, Jul 1976, *Brooker* 5274 (BRI, CANB); Kroombit Tops, c. 60 km SW of Gladstone, Jun 1977, *Crisp* 2809 (AD, BRI, CANB, L, NSW); T.R. 18, 40 miles [64 km] SSW of Gladstone, Oct 1964, *Epp* s.n. (BRI); Bulburin, Aug 1957, *Webb & Tracey* 3308 (BRI). BURNETT DISTRICT: summit of Boolbunda Rock, near Mt Perry, Aug 1986, *Bean* 478 (BRI); Widgee–Manumbar road, May 1985, *Brooker* 9021 (BRI); summit of Mt Woowoonga, Dec 1986, *Forster* PIF2753 (BRI, NSW); Mt Perry summit, Oct 1995, *Sparshott* KMS644 & *Sparshott* (BRI, CANB, MEL). WIDE BAY DISTRICT: Mt Walsh N.P., south of Biggenden, May 1994, *Bean* 7696 (BRI); Mt Molangul, SF 391, SW of Miriam Vale, Sep 1995, *Bean* 8935 & *Robins* (BRI, CANB); on Jimna–Kenilworth road, c. 1.5 km NE of Funnels hut road turnoff, Oct 1982, *McDonald* 3654 & *Williams* (BRI, CANB, NSW). DARLING DOWNS DISTRICT: Nelson Street reservoir, Toowoomba, Jul 1996, *Bean* 10452 (BRI, CANB). MORETON DISTRICT: Hartmann Park, Crows Nest, Aug 1994, *Bean* 7843 (BRI, NSW); east of ‘Fair Hills’, SW of Cooyar, Aug 1996, *Bean* 10619 (BRI, CANB, NSW).

Distribution and habitat: *E. montivaga* occurs in the Dicks Tableland to Eungella area west of Mackay, and between Kroombit Tops and Toowoomba (Map 3). Despite this extensive distribution, it is an uncommon species, restricted to small populations on shallow sandy soils derived from acid volcanic rocks. In the Dicks Tableland to Eungella area, it grows only

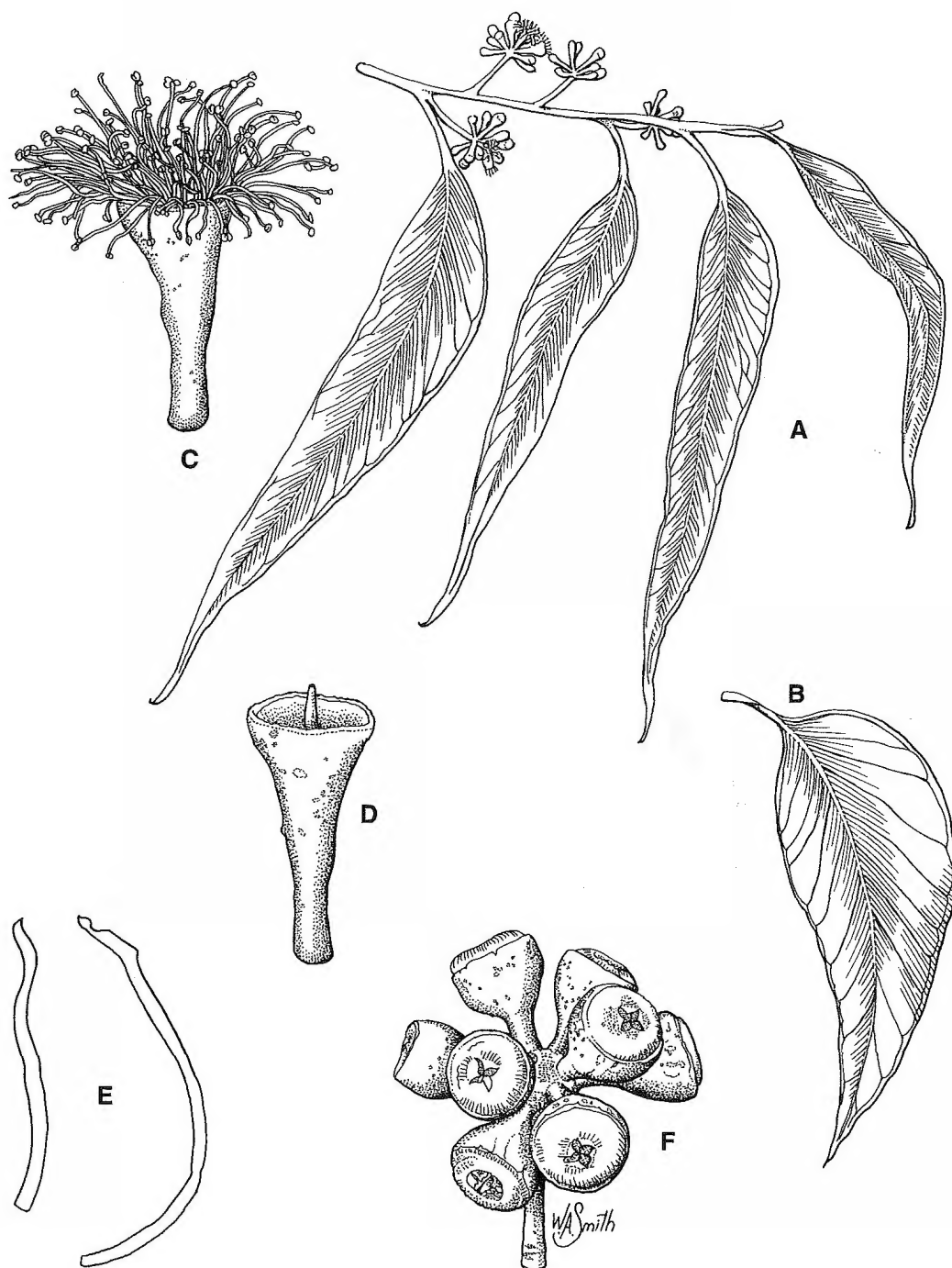
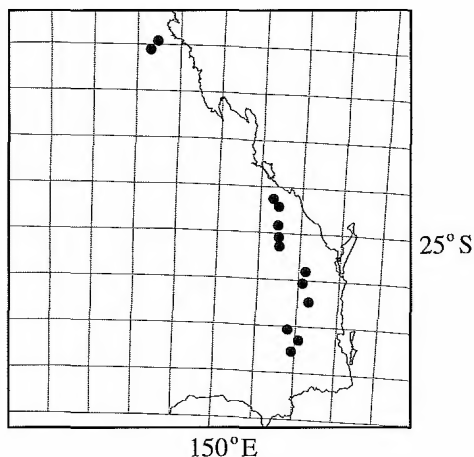


Fig. 1. *Eucalyptus montivaga*. A. Adult leaves and inflorescences $\times 0.6$. B. juvenile leaf $\times 0.6$. C. flower $\times 5$. D. flower with stamens removed, showing short tapered style $\times 5$. E. staminodes $\times 16$. F. fruits $\times 2$. All from *Bean* 10692.

at altitudes above about 900 metres. Between Kroombit Tops and Toowoomba, most populations are above 600 metres, although it may occur at lower altitude on steep southerly slopes.



Map 3. Distribution of *E. montivaga*.

Phenology: Flowers have been recorded between July and January.

Notes: *E. montivaga* differs from *E. racemosa* by its grey, fibrous bark persistent on the trunk and larger branches, and the pedicels 3.5–5.5 mm long (pedicels 1.5–4 mm long for *E. racemosa*). *E. montivaga* differs from *E. campanulata* by its hemispherical fruits (vs. obconical to campanulate) and by the consistent presence of staminodes in the flowers.

Conservation status: While *E. montivaga* occurs only very sporadically along the coastal ranges of Queensland, it is not rare or threatened at this time.

Etymology: The species epithet *montivaga* is from the Latin, meaning 'wandering over mountains' and refers to the sporadic mountain habitat of the species.

9. *Eucalyptus racemosa* Cav., Icon. 4: 24 (1797). **Type:** New South Wales. Botany Bay, in 1793, *Née* s.n. (holo: MA, photo!).

E. micrantha DC., Prodr. 3: 217 (1828);
E. haemastoma var. *micrantha* (DC.)

Benth., Fl. Austral. 3: 212 (1867). **Type:** New Holland, in 1823, *F.W. Sieber* 497 (holo: G; iso: G, W), fide Chippendale (1988).

E. signata F.Muell., J. Proc. Linn. Soc., Bot. 3: 85 (1859); *E. micrantha* var. *signata* (F.Muell.) Blakely, Key Eucalypts 219 (1934); *E. racemosa* var. *signata* (F.Muell.) R.D.Johnst. & Marryatt, Comm. For. Timber Bur. Leaflet 92: 20 (1965). **Type:** Queensland. MORETON DISTRICT: Brisbane River, undated, *F. Mueller* s.n. (holo: MEL; iso: K), fide Chippendale (1988).

E. haemastoma var. *capitata* Maiden, Crit. Revis. Eucalyptus 1: 319 (1908), **syn. nov.** **Type:** New South Wales. CENTRAL TABLELANDS: Mt Victoria, April 1889, *J.H. Maiden* (holo: NSW).

E. haemastoma var. *sclerophylla* Blakely, Key Eucalypts 218 (1934); *E. sclerophylla* (Blakely) L.A.S.Johnson & Blaxell, Contr. New South Wales Natl. Herb. 4: 381 (1973), **syn. nov.** **Type:** New South Wales. CENTRAL TABLELANDS: Mt Victoria, November 1899, *J.H. Maiden* (holo: NSW).

Tree to 25 m tall. Bark smooth throughout, grey or white, marked by insect scribbles; branchlets not glaucous. Lignotuber present. Seedling leaves opposite for c. 8 pairs. Petioles (3rd pair) c. 2 mm long. Juvenile leaves alternate, petiolate, broadly ovate, falcate, twisted vertically, apex acute. Adult leaves alternate, petiolate, lanceolate, 9–15 × 1.3–2.6 cm, acuminate, oblique, concolorous, bluish-green; lateral veins widely spaced, at c. 30–40° to midrib, reticulation sparse, intramarginal vein distinct, c. 1.0 mm from margin, oil glands numerous, 400–600/square cm, of various sizes, many per areole. Inflorescence simple, axillary; umbellasters 9–17-flowered; peduncles terete, 9–13 mm long; pedicels 1.5–4.0 mm long. Mature buds clavate, c. 3.5 × 2.5 mm. Operculum single, hemispherical, minutely umbonate. Filaments inflexed, anthers versatile, reniform, dehiscing by confluent slits, staminodes present in outer whorls of all

flowers. Floral cavity c. 2.0 mm long. Style c. 0.7 mm long at anthesis; stigma blunt. Fruit hemispherical, 4.0–5.0 mm long, 5.0–6.0 mm diameter, 4(5)-locular, disc forming a broad rim, slightly convex to slightly concave; valves at rim level. Seeds cuboid or pyramidal, brown-black, chaff similar but paler.

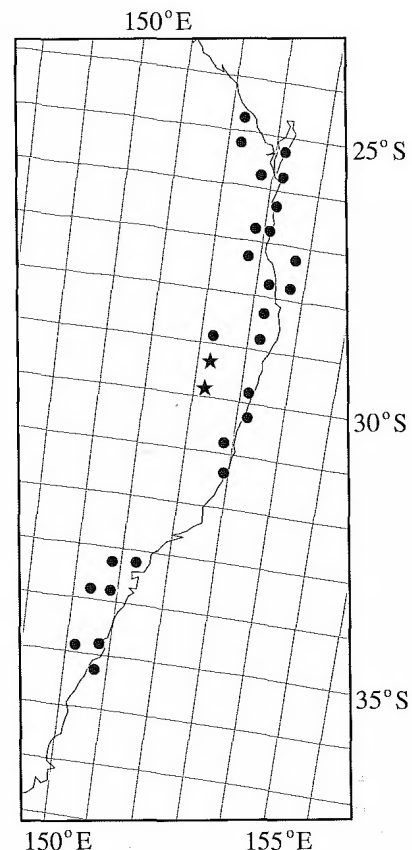
Selected specimens: Queensland. WIDE BAY DISTRICT: Wide Bay Military Training Area, Sep 1980, *Adams* 3541 (BRI, CANB); beside Elliot River, 200 m N of Coonarr turnoff, May 1985, *Bean* 200 (BRI); Mt Kandanga, west of Imbil, Apr 1993, *Bean* 5980 (BRI, NSW); Fraser Island, Oct 1921, *White* 1334 (BRI); Tin Can Bay, Sep 1943, *White* 12252 (BRI). MORETON DISTRICT: SF 531, SW of Esk, 4.5 km from Esk–Toowoomba road, Apr 1989, *Bean* 1020 (BRI); Mt Gravatt graveyard, Jan 1972, *Brooker* 3399 (BRI, CANB); Chester road, 2.5 km E of Advancetown–Numinbah road, Feb 1977, *Brooker* 5556 (BRI, CANB, NSW); North Stradbroke Is., Feb 1973, *Durrington* s.n. (BRI); Deer Reserve SF, Gregors creek, near Kilcoy, Apr 1994, *Grimshaw* G602 & *Figg* (BRI, NSW); below Mt Beerwah on E side, Oct 1993, *Slee & Lepschi* 3415 (BRI, CANB, NSW). **New South Wales.** NORTH COAST: Koonyum Range, W of Mullumbimby, Jul 1993, *Bean* 6179 (BRI); 1.5 km west of Red Rock, Aug 1985, *Foreman* 946 (BRI, CANB, MEL, NSW). CENTRAL TABLELANDS: Burrawang Ridge Rd., 1.6 km from Gap Rd, SE of Wingello, Mar 1995, *Brooker* 12138 (BRI, CANB, NSW); 1.6 km S of Mt Victoria towards Blackheath, Jul 1974, *Kleinig* DK130 (BRI, CANB). CENTRAL COAST: Great Western Highway, opposite Faulconbridge Railway station, Apr 1975, *Chippendale* GC1201 & *Brennan* (BRI); SW corner of Castlereagh S.F. off the Northern road, Sep 1984, *Coveny* 11883 & *Goodwin* (BRI, NSW). SOUTH COAST: c. 500 m NE of Wreck Bay village at the junction of Boorarla, Wreck Bay and Summercloud Bay roads, Aug 1991, *Lyne* 418 et al. (BRI, CANB, MEL, NSW).

Distribution and habitat: *E. racemosa* is widespread from Jervis Bay in New South Wales to Bundaberg and Fraser Island in southern Queensland (Map 4). It often grows on coastal lowlands on sandy soil, but also extends onto ranges on shallow soils derived from sandstone or rhyolite.

Phenology: Flowering can occur in almost every month of the year, with an apparent peak in the August–November period.

Notes: There appear to be no significant differences between the entities *E. racemosa*, *E. sclerophylla* and *E. signata*. In Hill (1991), these three ‘species’ are keyed using geography and the character of leaf glossiness. I have not found leaf glossiness to be diagnostic for Scribbly Gums as it can vary considerably

within a population. Since I have been unable to distinguish these entities either in the herbarium or in the field, I have included them in *E. racemosa* Cav.



Map 4. Distribution of **E. olida* and ●*E. racemosa*.

- 10. *Eucalyptus haemastoma* Sm.,** Trans. Linn. Soc. London 3: 286 (1797). **Type:** New South Wales. Port Jackson, in 1794, *J. White* (holo: LINN, microfiche BRI).

Distribution and habitat: *E. haemastoma* is confined to the Central Coast of New South Wales, to the north and south of Sydney. It grows on sandstone hills with sandy or ‘sandy clay’ soil.

- 11. *Eucalyptus rossii* R.T.Baker & H.G.Sm.,** Res. Eucalypts 70 (1902). **Type:** New South Wales. CENTRAL TABLELANDS: Cow Flat, Bathurst, March 1901, *R.T. Baker*

s.n. (holo: NSW n.v., fide Chippendale (1988)).

Distribution and habitat: *E. rossii* is widely distributed in inland areas of New South Wales from Pilliga to south of Canberra. It prefers sandy to loamy soils, on low ridges in dry sclerophyll woodland.

Notes on some 'Green Ashes'

informal **Eucalyptus** subser. **Strictinae** L.D.Pryor & L.A.S.Johnson, A Classification of the Eucalypts 41 (1971).

Eucalyptus approximans Maiden, J. & Proc. Roy. Soc. New South Wales 53: 65 (1919). **Type:** New South Wales. NORTHERN TABLELANDS: Barren Mountain, in 1901, *H. Deane* s.n. (holo: NSW).

Distribution and habitat: *E. approximans* is endemic to Barren Mountain near Dorriggo in New South Wales. It grows on a trachyte mountainside with very little soil development, forming an almost pure stand.

Eucalyptus codonocarpa Blakely & McKie, Proc. Linn. Soc. New South Wales 55: 589 (1930); *E. approximans* subsp. *codonocarpa* (Blakely & McKie) L.A.S.Johnson & Blaxell, Contr. New South Wales Natl. Herb. 4: 453 (1973). **Type:** New South Wales. NORTHERN TABLELANDS: Pheasant Mtn, 2 miles [3 km] NE of Backwater, 30 October 1929, *E.N. McKie, T. Youman & W.F. Blakely* s.n. (holo: NSW; iso: BRI).

E. microcodon L.A.S.Johnson & K.D.Hill, Telopea 4(2): 348 (1991), **syn. nov.** **Type:** Queensland. MORETON DISTRICT: Mt Barney, south ridge, 17 May 1969, *C.R. Dunlop* s.n. (holo: NSW).

Distribution and habitat: *E. codonocarpa* extends from Mt Maroon in south-eastern Queensland to Glen Innes, northern New South Wales. It grows on rock outcrops of granite or rhyolite, where soil development is very limited.

Notes: *E. codonocarpa* is readily distinguished from *E. approximans* by its larger fruits, and broader leaves without raised oil glands when dry. However, the type of *E. microcodon* cannot be distinguished from *E. codonocarpa*. The distinguishing characters given by Hill & Johnson (1991) appear to be either not consistent or erroneous. The leaf dimensions, thickness and venation pattern differences between *E. microcodon* and *E. codonocarpa* (as cited by Hill & Johnson) are virtually indistinguishable. The cited difference in oil gland density is observable in some specimens but not in others. The fruit sizes of the two 'taxa' are not significantly different, and while the Springbrook to Mt Maroon material does more often possess 7-flowered inflorescences, this feature is also present in *E. codonocarpa* from the type locality.

Acknowledgements

I am grateful to Will Smith for the illustrations, Les Pedley for the Latin diagnosis, and the Director of the National Herbarium of New South Wales (NSW) for the loan of relevant specimens.

References

- BOLAND, D.J., BROOKER, M.I.H., CHIPPENDALE, G.M., HALL, N., HYLAND, B.P.M., JOHNSTON, R.D., KLEINIG, D.A. & TURNER, J.D. (1984). *Forest Trees of Australia*, 4th. ed. Melbourne: Thomas Nelson.
- BROOKER, M.I.H. (1977). Internal Bud Morphology, Seedling Characters and Classification in the Ash Group of Eucalypts. *Australian Forest Research* 7: 197–207.
- CHIPPENDALE, G.M. (1988). *Eucalyptus, Angophora* (Myrtaceae), *Flora of Australia* 19. Canberra: Australian Government Publishing Service.
- HILL, K.D. (1991). *Eucalyptus*. In *Flora of New South Wales* 2: 76–142. Sydney: New South Wales University Press.
- HILL, K.D. & JOHNSON, L.A.S. (1991). Systematic studies in the eucalypts – 4. New taxa in *Eucalyptus* (Myrtaceae). *Telopea* 4(2): 321–349.
- JOHNSON, L.A.S. & BLAXELL, D.F. (1973). New Taxa and Combinations in *Eucalyptus* II. *Contributions from the New South Wales National Herbarium* 4: 381.
- JOHNSON, L.A.S. & HILL, K.D. (1990). New Taxa and Combinations in *Eucalyptus* and *Angophora* (Myrtaceae). *Telopea* 4(1): 37–108.

Bean, *Eucalyptus* ser. *Psathyroxyla*

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LADIGES, P.Y., NEWNHAM, M.R. & HUMPHRIES, C.J. (1989). Systematics and Biogeography of the Australian "Green Ash" Eucalypts (Monocalyptus). *Cladistics* 5:345–364.

LADIGES, P.Y., PROBER, S.M. & NELSON, G. (1992). Cladistic and Biogeographic Analysis of the 'Blue Ash' Eucalypts. *Cladistics* 8: 103–124.

PRYOR, L.D. & JOHNSON, L.A.S. (1971). *A Classification of the Eucalypts*. Canberra: Australian National University:

***Leptochloa southwoodii* (Poaceae: Chloridoideae), a new species from south-east Queensland**

Neil Snow¹ and Bryan K. Simon

Summary

Snow, Neil, & Bryan K. Simon. (1997). *Leptochloa southwoodii* (Poaceae, Chloridoideae), a new species from south central Queensland. *Austrobaileya* 5(1): 137–143. *Leptochloa southwoodii*, a new species from the brigalow belt of southern Queensland, is described and diagnosed from *L. ligulata* Lazarides, its apparent sister species.

Key words: *Leptochloa southwoodii*, Poaceae, Chloridoideae, Queensland, Australia, conservation

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Introduction

The eragrostoid genus *Leptochloa* P. Beauv. (sensu lato, including *Diplachne* P. Beauv.) consists of approximately forty taxa, the diversity of which is spread fairly equally among the neotropics, Africa plus southern Asia, and Australia (Clayton & Renvoize 1986; Watson & Dallwitz 1994; Snow 1997a). A few species also are known primarily or exclusively from oceanic islands (Snow 1997a). The generic boundaries of *Leptochloa* have been the subject of more dispute than any other in the subfamily (Jacobs, 1987) and numerous problems have surrounded the taxonomy of at least two species groups (Snow 1997a, 1997b).

During April of 1996 we made extensive collections of *Leptochloa* as part of fieldwork for the first author's dissertation research, which entailed monographing *Leptochloa* from a global perspective (Snow 1997a). Our activities focused primarily on the brigalow (*Acacia harpophylla*) vegetation of southern and central Queensland (Beadle 1981), the center of diversity for *Leptochloa* in Australia. In the Darling Downs District in the vicinity of Southwood National Park and an area

somewhat north we found an undescribed species of *Leptochloa* that is consistently diagnosable by ordinary means (Snow 1997b), which we describe here as new.

Materials and methods

Specimens were collected in the field, pressed and dried following standard procedures. Material collected for further study included fresh green leaf material for anatomical analyses and anticipated DNA-based molecular studies, young inflorescences for meiotic studies, and mature caryopses for growing plants in the greenhouse. Since the late stage of the flowering season resulted in a relatively poor quality of possible type specimens collected in the field, we opted to prepare greenhouse grown material as the type specimens. Plants were grown in the greenhouse from seed sources Snow & Simon 7362 and 7364 for making additional observations. After greenhouse grown plants were photographed and measured, modifications were added to the initial species description, based primarily on field-collected specimens. Mature lemmas were analyzed for micromorphological characters by scanning electron microscopy following Snow (1996). Descriptive terminology follows Systematics Association Committee (1962).

Leptochloa southwoodii N. Snow & B.K. Simon, **sp. nov.** Haec species *Leptochloae ligulatae* Lazarides similis sed ab ea vagina foliari tubercula et pilos divergentes per totam longitudinem gerente etiam spiculis anguste ellipticis plerumque 3.5–4.6 mm longis differt. **Typus:** Snow 7401, a greenhouse-grown specimen based on seed collected from Snow & Simon 7364, Queensland: DARLING DOWNS DISTRICT: Along Surat Developmental Road 18 km W of its junction with Leichhardt Highway. In brigalow remnants. Common; with *Leptochloa divaricatissima*, *L. aff. fusca*, and *Acacia harpophylla*. Clay soil. GPS 27°22'50"S, 150°00'37"E. (Fig. 1) (Holo: BRI; iso: MO,CANB).

Additional specimens examined: Queensland. DARLING DOWNS DISTRICT: 17.8 km W of Moonie on Moonie Highway, roadside in disturbed clay soil on edge of remnants of *Callitrus* woodland, 27°48'39"S, 150°13'32"E, 10 April 1996, Snow & Simon 7350 (BRI,CANB,K,MO,NSW); 22 km W of Moonie along Moonie Highway. Edge of remnants of *Callitrus*-brigalow woodland, 27°49'15"S, 150°11'32"E, 10 April 1996, Snow & Simon 7362 (BRI,K,MO); 'Myall Park', Crater Paddock, 27°13'23"S, 149°41'44"E, drying margin of gilgai, 25 April 1994, Jacobs 7133 (BRI,NSW); Chinchilla, Beasley 127 (BRI). LEICHHARDT DISTRICT: Greycliffe, White 10878a (BRI), 24°2'-S, 150°1'-E. PORT CURTIS DISTRICT: Near Wandoan, Belson 5440 (K).

Plants annual, caespitose, 137–170 cm tall in flower. Culms one to several, compressed-keeled below and striate, sometimes branching, ascending to erect, round and hollow. Internodes glabrous. Nodes mostly four, glabrous. Leaf sheaths mostly green and distinctly striate, with moderate to dense covering of tuberculate-based pilose hairs throughout length (sometimes the hairs absent near base), the hairs mostly divergent or ascending, but often disarticulating with maturity. Ligule membranous, 3–5.5 mm long, becoming somewhat lacerate, somewhat shorter in the middle. Leaf blades scabrous above and below, lacking pilose hairs and tubercles; to 12.5 mm wide, linear, flat to inrolled, to over 55 cm long. Mature panicles completely exerted or somewhat inserted below, up to half the length of the culm, somewhat nodding above, sometimes pilose just below lowest

panicle branch. Panicle branches of up to 65 alternate to subwhorled racemes, these to 17.5 cm long but decreasing in length apically, slightly divergent to (mostly) ascending. Spikelets narrowly elliptic (3:1), 3–6 flowered, 3.5–4.6 mm long, distant to somewhat imbricate. Callus glabrous to slightly hairy. Glumes 1-nerved, thinly membranous, scabrous along midnerves. Lower glume broadly lanceolate to ovate (2:1), 0.8–1.3 mm long, apically acute to somewhat obtuse. Upper glume elliptic (2:1), ovate, to widely obovate (6:5), 1.2–1.7 mm long. Rachilla segments c. $\frac{2}{5}$ – $\frac{1}{3}$ the length of the lemma. Lowest lemmas (when flattened) elliptic to slightly obovate, 1.5–.0 mm long, apically truncate to broadly obtuse, often broadly emarginate; lateral nerves flush with surface and not extending to edges, sericeous along lateral nerves and midnerve. Palea narrowly elliptic (3:1), subequal, sericeous along the nerves. Anthers ca 0.2 mm long. Caryopsis ca 0.8 mm long, obovate (3:2) to elliptic (3:2) in hilar profile, more or less circular in cross-section at midpoint, the pericarp coarsely rugose or minutely scalariform. Chromosome number unknown.

Notes: In overall morphology *Leptochloa southwoodii* most closely resembles another species endemic to Queensland, *L. ligulata* Lazarides (Lazarides, 1980). It differs most notably from the latter by having a moderate to dense covering of tubercle-based pilose hairs occurring throughout the length of the leaf sheath (Fig. 2), which at the most only occur at the very base of the lower sheaths of *L. ligulata* (Snow, pers. obs.). In addition, the spikelets of *L. southwoodii* are somewhat longer and more elliptic. The ranges of these two species remain poorly known (Fig. 3), but a recent collection (Snow & Simon 7324; BRI,MO) of *Leptochloa ligulata* from the Darling Downs indicates at least some overlap.

The pubescent sheaths of *Leptochloa southwoodii* give it a superficial resemblance to *L. peacockii* (Maiden & Betche) Domin, a northeast and eastcentral Australian taxon of unstable rank (Lazarides 1980; Stanley & Ross 1989; Simon 1993; Wheeler et al. 1994), which Snow (1997a) reduced in rank. However,

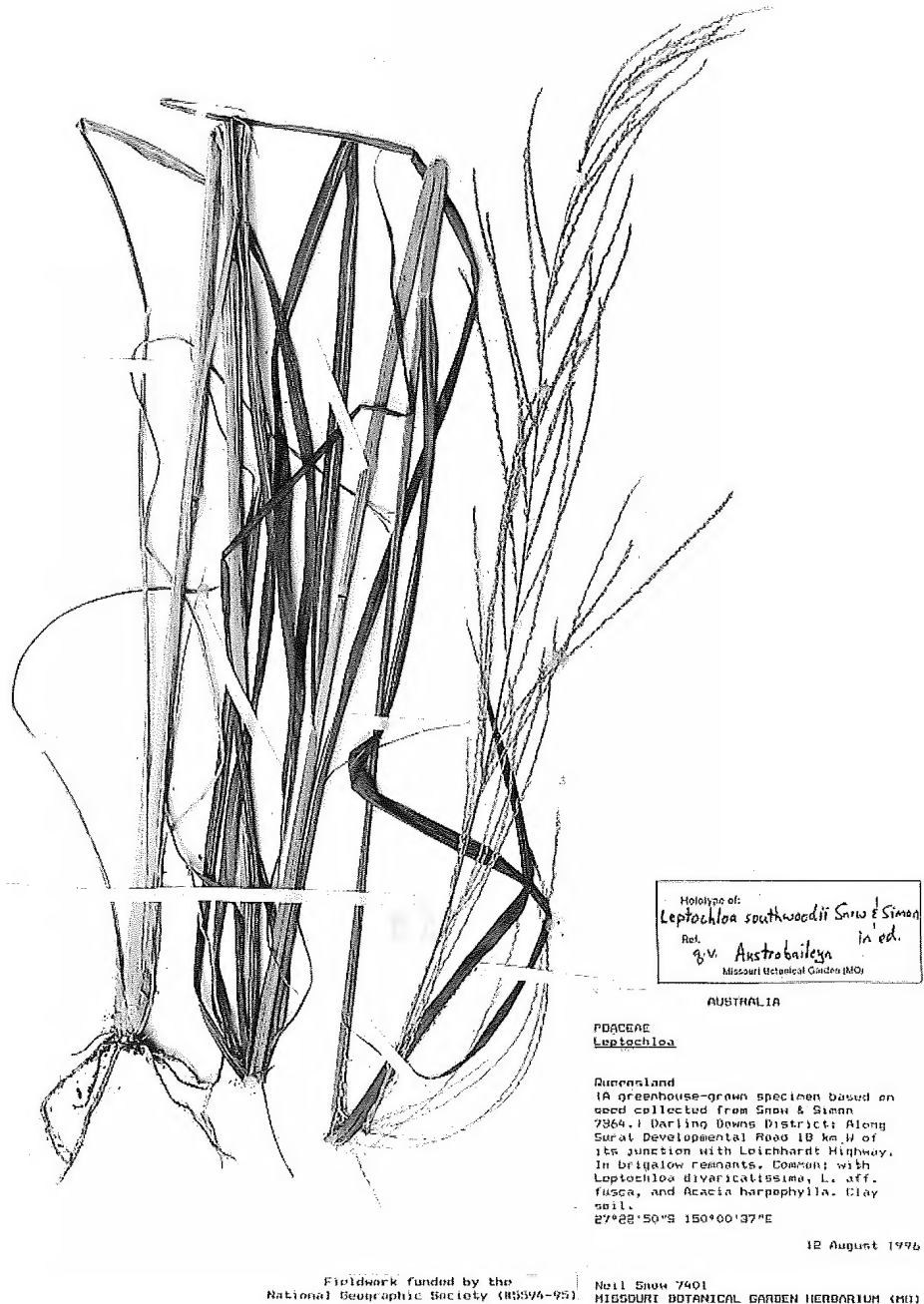


Fig. 1. Holotype of *Leptochloa southwoodii*, (Snow 7401), a specimen grown in the greenhouses at the Missouri Botanical Garden from seed collected from Snow & Simon 7364 (housed at BRI)



Fig. 2. Close-up of holotype of *Leptochloa southwoodii* prior to pressing (cf Fig. 1) showing moderate to dense covering of tubercle-based divergent pilose hairs on the leaf sheaths, which consistently diagnoses the species from the likely sister species, *Leptochloa ligulata* Lazarides.

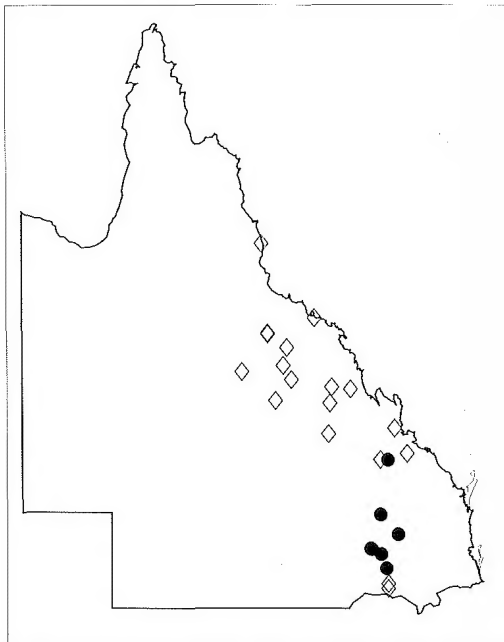


Fig. 3. Range map showing the known distribution of ● *Leptochloa southwoodii* and ◇ *L. ligulata*, both apparent endemics to Queensland.

L. southwoodii differs by lacking the moderate to dense covering of appressed tomentose hairs along the leaf blades and the widely diverging (at maturity), relatively long lemmatal hairs characteristic of *L. peacockii* (Snow 1997a).

The leaf sheaths of our field collections appeared to have small amounts of a brownish exudate, and thereby had significant amounts of windblown soil and other debris adhered to their surface. However, greenhouse grown material lacked any apparent exudate (Snow, pers. obs.).

Leptochloa southwoodii was discovered after the completion of a study of lemmatal micromorphological characters of *Leptochloa* and related genera (Snow 1996). The species was found to possess cork cells, normal macrohairs, chloridoid bicellular microhairs, and prickles, but was lacking in papillae born on either short or long cells and lacking in silica cells (Fig. 4), a combination of which accords with many species of *Leptochloa* (Snow 1996).

Etymology: Since we first collected the new species along the southern boundary of Southwood National Park it seems appropriate to honour the park with the specific epithet.

Conservation status: Given time constraints we were unable to assess more thoroughly the overall range and abundance of *Leptochloa southwoodii*, which would be better accomplished earlier in the growing season. Along the southern boundary of Southwood National Park specimens were seen only sporadically in the area between the road and adjacent fencelines, and rarely did we find more than five individuals at a given site. From Southwood National Park we encountered plants along the roadside to about 15 km W of Moonie. Along the Surat Developmental Road the species was seen to be locally common at one site around gilgais in brigalow remnants just over the fenceline south of the road. Pending the discovery of additional populations that would enlarge the number of known sites and overall geographical range, we recommend that *L. southwoodii* be listed as a vulnerable species.

Acknowledgments

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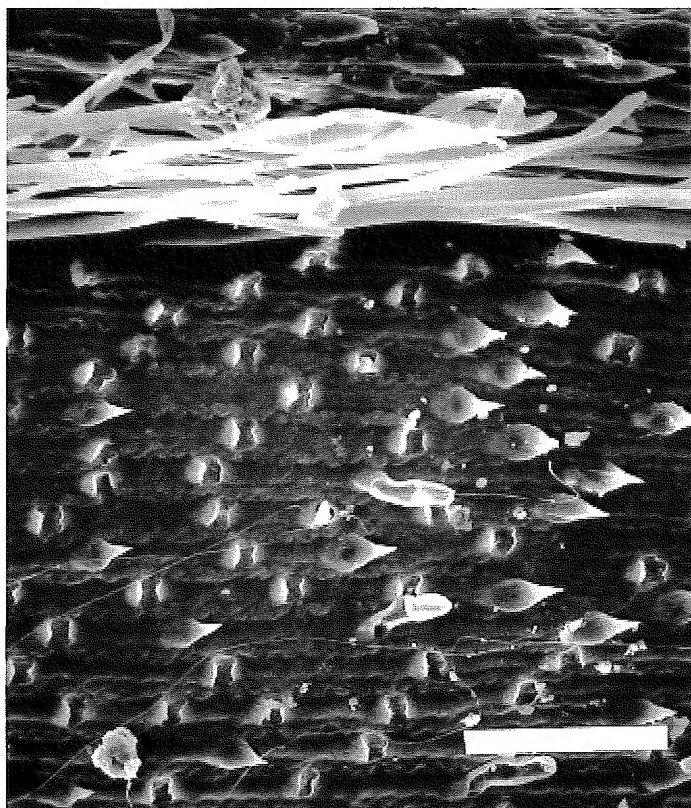


Fig. 4. Scanning electron microscope image of lemmatal surface of *Leptochloa southwoodii* N. Snow & B.K. Simon (Snow 7364, MO). Lemmatal apex towards right; macrohairs lie the near midvein (not visible). Bar = 50µm.

References

- BEADLE, N.C.W. 1981. *The Vegetation of Australia*. Cambridge: Cambridge University Press.
- CLAYTON, W. D., & RENVOIZE, S. 1986. *Genera Graminum*. London: Her Majesty's Stationery Office.
- JACOBS, S.W.L. 1987. Systematics of the chloridoid grasses. Pp. 277–286 in T. R. Soderstrom, K. W. Hilu, C. S. Campbell & M. E. Barkworth (editors), *Grass Systematics and Evolution*. Washington, D.C.: Smithsonian Institution Press.
- LAZARIDES, M. 1980. The genus *Leptochloa* Beauv. (Poaceae, Eragrostideae) in Australia and Papua New Guinea. *Brunonia* 3: 247–269.
- SIMON, B.K. 1993. *A Key to the Australian Grasses*. Second Edition. Brisbane: Department of Primary Industries, Queensland.
- SNOW, N. 1996. The phylogenetic utility of lemmatal micromorphology in *Leptochloa* s.l. and related genera in subtribe Eleusininae (Poaceae, Chloridoideae, Eragrostideae). *Annals of the Missouri Botanical Garden* 83: 504–529.
- 1997a. Phylogeny and systematics of *Leptochloa* P. Beauv. sensu lato (Poaceae, Chloridoideae). Ph.D. dissertation, Washington University, St. Louis.
- 1997b. Application of the phylogenetic species concept: a botanical monographic perspective. *Austrobaileya* 5(1): 137–143 (1997).
- STANLEY, T.D., & ROSS, E.M. 1989. *Flora of south-eastern Queensland. Volume III*. Brisbane: Queensland Department of Primary Industries Misc. Publ. QM88001.

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Systematics Association Committee for Descriptive Biological Terminology. 1962. II. Terminology of simple symmetrical plane shapes (Chart 1). *Taxon* 11: 145-156.

WATSON, L., & DALLWITZ, M.J. 1994. *Grass Genera of the World*. Second Edition. Cambridge: C.A.B. International.

WHEELER, D.J.B., JACOBS, S.W.L., & NORTON, B.E. 1994. *Grasses of New South Wales*. Second Edition. Armidale: University of New England Publishing Unit.

Lilaeopsis brisbanica (Apiaceae), a new species from Queensland, Australia

A.R. Bean

Summary

Bean, A.R. (1997). *Lilaeopsis brisbanica* (Apiaceae), a new species from Queensland, Australia. *Austrobaileya* 5(1): 145–148. *Lilaeopsis brisbanica* A.R.Bean is described and illustrated, and diagnosed against related species. Notes on habitat, ecology, cultivation and conservation status are provided.

Key words: *Lilaeopsis*, taxonomy, Australian flora, *Lilaeopsis brisbanica*, Apiaceae, Umbelliferae.

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Introduction

Members of the genus *Lilaeopsis* Greene are semi-aquatic herbs from temperate to subtropical areas of both hemispheres. Species are known from the United States of America, Mexico, several South American countries, New Zealand and Australia (Hill 1927, Affolter 1985). The genus was first recorded for Australia by J.D. Hooker in 1852. Bentham (1867) subsequently included all Australian material under the name *Crantzia lineata* (Michx.) Nutt. (now *Lilaeopsis chinensis* (L.) Kuntze), a species whose type comes from the eastern United States of America. A worldwide revision was provided by Hill (1927), who enumerated three species for Australia at that time, and added another species soon after (Hill 1929). Eichler (1963) discussed the nomenclature of the Australian species. In a recent monograph of the genus, Affolter (1985) accepted just two species for Australia, *L. polyantha* (Gand.) H.Eichler and *L. fistulosa* A.W.Hill.

The taxon described here as *L. brisbanica* was first collected by Amalie Dietrich between 1863 and 1865, and soon after by F.M. Bailey. Hill (1927) made special mention of Dietrich's specimens, and thought that they could represent a new species, distinct from *L. australica* (syn. *L. polyantha*), but

as her specimens lacked mature fruits, Hill conservatively retained them under *L. australica*. Blake (1959) also noted the distinctiveness of the Queensland material and he ascribed it to *L. novae-zealandiae* (Gand.) A.W.Hill, a species described from the South Island of New Zealand. Affolter (1985) adopted a very broad species concept for *L. polyantha*, and concluded that "the Queensland specimens are within the range of variation seen elsewhere in *L. polyantha* in Australia". The present study reveals that the Queensland material is distinct from both *L. polyantha* and *L. novae-zealandiae*.

Taxonomy

***Lilaeopsis brisbanica* A.R.Bean sp. nov.**,
affinis *L. novae-zealandiae* autem bracteis
0.5–1.3 mm longis, fructibus 7 vittis in
quoque mericarpo et costis dorsalibus
prominentioribus praeditis, plerumque
septis paucioribus in quoque folio differt.
Typus: Queensland. MORETON DISTRICT:
Brisbane River, adjacent to Queenscroft
St., Chelmer, 26 November 1995,
A.R. Bean 9243 (holo: BRI; iso: MEL,
MO, NSW, distribuendi).

Mat-forming herbs 1.5–4 cm high, glabrous, rhizomatous, producing roots and leaves at the nodes. Roots white, slender, to c. 10mm long. Rhizomes c. 0.5 mm in diameter, white or occasionally green when close to surface.

Leaves all radical, 3–6 arising from each node, or on a vertical rhizome branch up to 10 mm long; petioles c. 1.5 mm long, sheathing. Leaves hollow, linear, narrowly elliptical in cross-section, 11–36 mm long, leaf width uniform throughout or slightly broader near apex, 0.2–0.5 mm wide midway along lamina, up to 1.0 mm wide near apex, apex obtuse, leaves with 5–7 thin transverse septae, unstricted at septae. Inflorescence a simple, 2–5-flowered umbel, one only from each node, peduncle terete, 4.5–11.5 (–14) mm long. Pedicels slender, terete, 3.5–7.0 mm long, together subtended by 2–3 broadly ovate bracts, each 0.5–1.3 × 0.4–0.6 mm. Flowers bisexual, 2.1–2.5 mm in diameter. Calyx lobes 5, vestigial, c. 0.1 mm long, persistent. Petals 5, broadly ovate, 0.8–0.9 × 0.5–0.6 mm, spreading, alternating with the calyx lobes, white or greenish, broad at base, apex acute, midrib thickened. Stamens 5, antepetalous; filaments c. 0.4 mm long; anthers bilocular, 0.25–0.4 mm long, dehiscing by longitudinal slits. Ovary inferior, 2-carpellate, each carpel containing 1 ovule. Styles 2, each arising from inner edge of carpel summit, persistent; stigmas scarcely distinguishable. Fruits ovoid to ellipsoid, 1.2–2.0 mm long, 1.0–1.3 mm diameter, each mericarp with 3 dorsal and 2 lateral ribs; all ribs prominent in cross-section, with lignified tissue present. Vittae 7, alternating with the ribs and including 3 along the commissure. Fig. 1 A–D.

Specimens examined: Queensland. MORETON DISTRICT: Breakfast Creek, undated, *Bailey* s.n. (BRI); Brisbane River, in 1874, *Bailey* s.n. (BRI); Brisbane River, SW of Brisbane, 100 m downstream from Jindalee bridge, Oct 1993, *Bean* 6778 (BRI, MO); Moggill Creek, 200m from Brisbane River, Jan 1995, *Bean* 8170 (BRI); Caboolture, Nov 1956, *Blake* 20044 (BRI, NSW); Brisbane River, 1863–65, *Dietrich* s.n. (BRI, K); Brisbane River, under Indooroopilly bridge, Nov 1980, *Olsen* 215 & *Dillewaard* (BRI); Moggill Creek, Nov 1957, *Whitehouse* s.n. (BRI).

Distribution and habitat: *L. brisbanica* is currently known only from an 11 kilometre-long section of the Brisbane River, between Moggill Creek and Oxley Creek. It is apparently extinct at some of the localities where it was formerly recorded, e.g. Breakfast Creek, Caboolture. It grows along tidal riverbanks in grey saline mud, in association with mangrove trees, particularly *Excoecaria agallocha* L. and *Aegiceras corniculatum* (L.) Blanco, and often adjacent to, or mixed with, *Triglochin striata* Ruiz & Pav.

Phenology: Flowers and fruits have been recorded between October and January.

Affinities: *L. brisbanica* seems most closely related to *L. novae-zealandiae*, because of external fruit morphology and leaves narrowly elliptical in cross-section, but differs by the 7 vittae per fruiting mericarp (8 for *L. novae-zealandiae*), bracts 0.5–1.3 mm long (1.5–3.0 mm long for *L. novae-zealandiae*), 5–7 septae per leaf (6–10 for *L. novae-zealandiae*), 2–5 flowers per umbel (4–8 for *L. novae-zealandiae*) and the more prominent dorsal ribs on the fruits.

L. brisbanica differs from *L. polyantha* by its fruits 1.2–2.0 mm long (2.5–3.5 mm for *L. polyantha*), 7 vittae per mericarp (8–9 for *L. polyantha*) and the much shorter leaves which are narrowly elliptical in cross-section, rather than terete.

Notes: *L. polyantha*, as circumscribed by Affolter (1985) is a heterogeneous assemblage of 3–5 taxa. I have not attempted to segregate the southern Australian taxa, and in my comparisons between *L. brisbanica* and *L. polyantha*, only the typical form of *L. polyantha* was considered. The type of *L. polyantha* was collected at Walcha on the New England Tableland of New South Wales.

L. brisbanica is geographically disjunct from other Australian *Lilaeopsis*. The nearest is that recorded by F. Mueller last century from Ballina, New South Wales. The Ballina specimen, lodged at MEL, represents *L. fistulosa* A.W.Hill, a species with long acute leaves, circular in cross-section, and relatively short inflorescences. A population of this species was recently located near Yamba (1.3 km S of Yamba, towards Angourie, Nov 1994, *Bean* 8033 (BRI, NSW)).

L. brisbanica is amenable to cultivation in pots, and it flowers and fruits readily. Fresh water appears to be quite satisfactory for its growth, and plantlets transplanted from the wild retain their general morphological characters in pot culture.

Conservation status: The risk category for *Lilaeopsis brisbanica* according to the criteria

of Chalson & Keith (1995) is 'critical' (criteria A, B1, B3, B5, B6, D). The species is known from only six populations in close proximity, each possibly comprising a single genotype. *L. brisbanica* is under threat from its limited distribution, trampling by horses, river-bank erosion, encroachment of weeds, and the

construction of jetties, retaining walls etc. The author has made extensive searches for *L. brisbanica* along other nearby tidal rivers, including the Maroochy R., Caboolture R., Pine R., Logan R., and Tweed R., and their tributaries, but without success.

The recommended conservation status for this species as defined by the *Queensland Nature Conservation Act 1992* is 'endangered'.

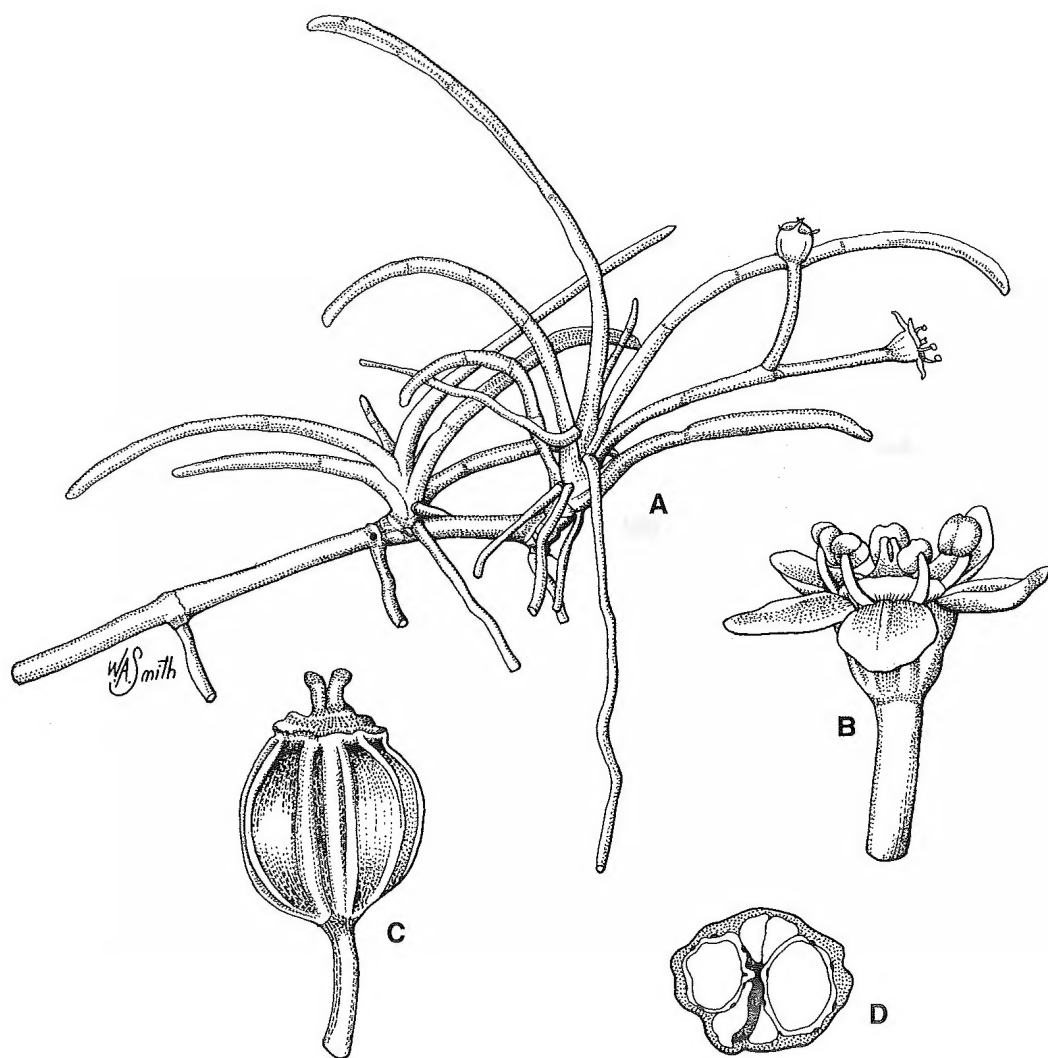


Fig. 1. *Lilaeopsis brisbanica*. A. whole plant $\times 4$. B. flower $\times 16$. C. fruit $\times 16$. D. transverse section of fruit $\times 16$. A.B.Bean 9243; C,D, Blake 20044.

Etymology: The species epithet refers to the city of Brisbane and the Brisbane River.

Acknowledgements

I wish to thank the Directors of NE, NSW and MEL for access to their herbaria, and the Director of CHR for the loan of material of *L. novae-zealandiae*. W. Smith provided the illustrations, and L. Pedley provided the Latin diagnosis.

References

- AFFOLTER, J.M. (1985). *A Monograph of the Genus Lilaeopsis (Umbelliferae)*. Systematic Botany Monographs, Vol. 6. United States of America: The American Society of Plant Taxonomists.
- BENTHAM, G. (1867). *Crantzia* in *Flora Australiensis* 3: 374. London: L. Reeve & Co.
- BLAKE, S.T. (1959). New or Noteworthy Plants, chiefly from Queensland, 1. *Proceedings of the Royal Society of Queensland*. 70: 33–46.
- CHALSON, J.M. & KEITH, D.A. (1995). *A Risk Assessment scheme for Vascular Plants: Pilot Application to the Flora of New South Wales*. Hurstville: National Parks and Wildlife Service.
- EICHLER, HJ. (1963). Some New Names and New Combinations relevant to the Australian Flora. *Taxon* 12: 295–297.
- HILL A.W. (1927). The Genus *Lilaeopsis*: a study in Geographical Distribution. *The Journal of the Linnean Society - Botany*. 47: 525–551.
- HILL, A.W. (1929). *Lilaeopsis* in Tasmania and New Zealand. *Bulletin of Miscellaneous Information, Kew*. 119–121.

Microcarpaea agonis (Scrophulariaceae), a new species from south-eastern Queensland

A.R. Bean

Summary

Bean, A.R. (1997). *Microcarpaea agonis* (Scrophulariaceae), a new species from south-eastern Queensland. *Austrobaileya* 5(1): 149–151. A new species in Scrophulariaceae, *Microcarpaea agonis* A.R.Bean, is described and illustrated. It is compared to *M. minima* and its conservation status is discussed.

Keywords: *Microcarpaea*, Scrophulariaceae, *Microcarpaea agonis*, Queensland, Australian flora.

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Introduction

The genus *Microcarpaea* was erected by Robert Brown in 1810, with the single species *M. muscosa*. This name is illegitimate, as it is based on *Paederota minima* J.König ex Retz. The necessary combination *Microcarpaea minima* was made by E. Merrill in 1912. *Microcarpaea* has been until now, recognised to be a monotypic genus. Several other names

have been published under *Microcarpaea*, but these are all referable to other genera (Bentham 1869, Merrill 1923). Barker (1981) suggested that *Peplidium* Delile should be merged with *Microcarpaea*, but later (Barker 1990) he advocated the retention of both genera, because of the different pollen morphology possessed by the two groups.

Taxonomy

Key to *Microcarpaea* species

- Leaves linear, 5–9 mm long, 0.3–0.5 mm wide; calyx tube 1.3–1.7 mm long, unribbed or only faintly ribbed; calyx teeth green ***M. agonis***
Leaves elliptical, 2.5–5 mm long, 0.7–1.5 mm wide; calyx tube 2.2–2.8 mm long, prominently ribbed; calyx teeth grey to brown ***M. minima***

***Microcarpaea agonis* A.R.Bean sp. nov.**,
affinis *M. minimae* autem calycis tubo
breviore latiore leviter nervato vel
enervato, calycis dentibus viridibus, foliis
linearibus 5–9 mm longis differt. **Typus:**
Queensland. DARLING DOWNS DISTRICT:
(exact locality withheld), S.F. 235, W of
Milmerran, 28 February 1996, A.R.Bean
9994 (holo: BRI; iso: AD, MEL,
distribuendi).

Herb, terrestrial, annual, to 5 cm high and
10 cm wide; stems angular, glabrous. Leaves
opposite, connected across nodes, linear,
5.0–9.0 × 0.3–0.5 mm, sessile, glabrous, striate,
apex obtuse. Flowers solitary, axillary,
bracteoles absent, pedicels absent or up to
0.3 mm long. Calyx tube ovoid, 1.4–1.7
× 1.0–1.2 mm, white, unribbed or weakly
ribbed, with sparse indumentum of patent
eglandular hairs; calyx teeth 5, deltate,
c. 0.7 × 0.5 mm, green, slightly thickened near
the middle, recurved in fruiting material,
margins ciliate. Corolla tube c. 3 mm long,
glabrous, slightly exerted from calyx tube,
2-lipped; upper lip scarcely bilobed or unlobed,

lower lip 3-lobed, mid-lobe slightly longer than lateral lobes, obtuse, margins ciliate. Stamens 2, fertile, epipetalous. Style 1, stigma expanded. Ovary 2-locular, ovules numerous, attached to a central placenta. Fruits ovoid, c. 1.0×1.0 mm, capsular, 2-locular, completely enclosed by calyx tube. Seeds ellipsoidal, yellowish, c. 0.3 mm long, longitudinally striate. Fig. 1.

Specimens examined: see type

Distribution and habitat: *M. agonis* is currently known only from the type locality. It was found on the margins of an *Eleocharis-Cyperus* dominated seasonal swamp, fringed by *Eucalyptus chloroclada* (Blakely) L.A.S.Johnson & K.D.Hill, in grey clay-loam soil. Some associated species are *Rotala mexicana* Cham. & Schltdl., *R. occultiflora* Koehne, *Cyperus difformis* L. and *Glossostigma diandrum* (L.) Kuntze.

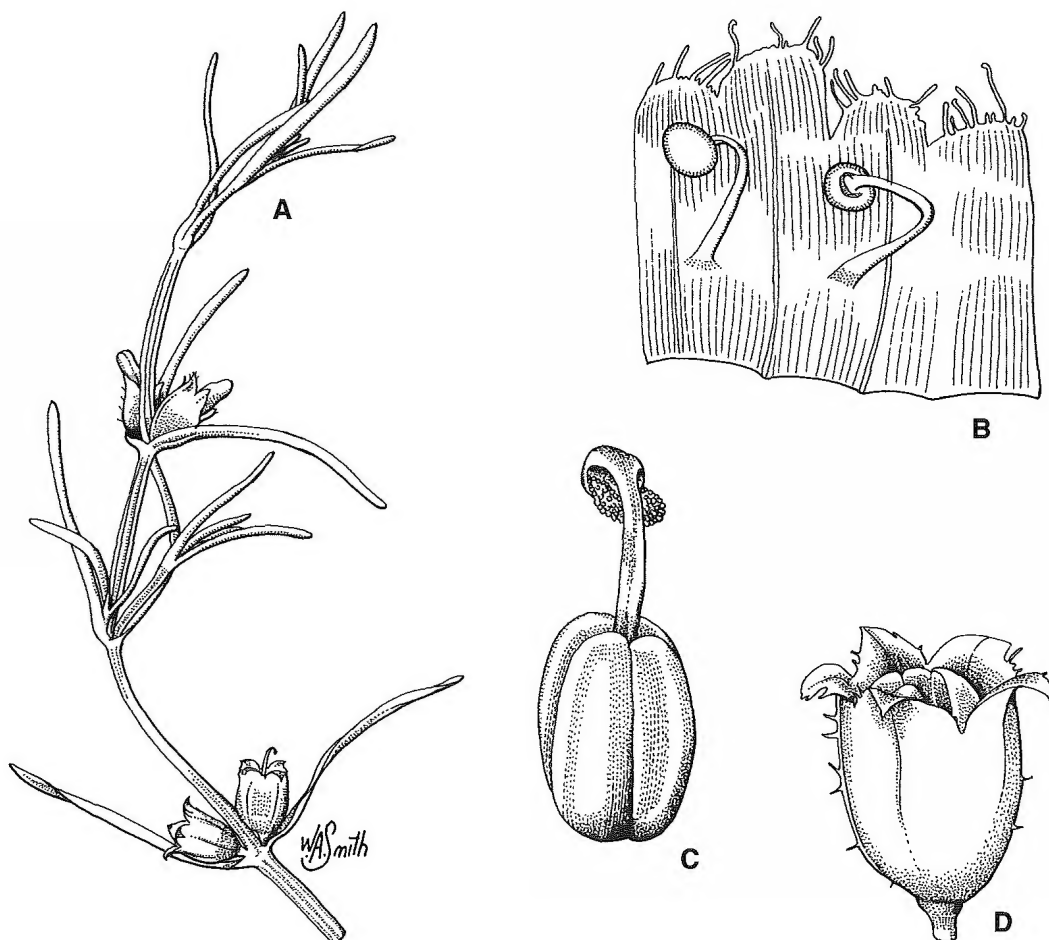


Fig. 1. *Microcarpaea agonis*. A. fertile branchlet $\times 4$. B. corolla and stamens $\times 32$. C. style and developing capsule $\times 32$. D. fruit $\times 16$. All from Bean 9994.

Phenology: Both flowers and fruits are present on the type specimen which was collected in February.

Notes: The new species is closely allied to *M. minima* in size and form, and they share the solitary axillary inflorescence with the flowers sessile or nearly so. *M. agonis* differs by its linear leaves 5.0–9.0 mm long (2.5–5.0 mm long for *M. minima*) and 0.3–0.5 mm wide (0.7–1.5 mm wide for *M. minima*), the shorter calyx tube which is unribbed or only faintly ribbed, and the green calyx teeth.

The distributions of *M. minima* and *M. agonis* are disjunct. *M. minima* is widespread, with occurrences in southern China, Japan, Indochina, Malesia and northern Australia. The type of *M. minima* was collected by Robert Brown in 1802 at Shoalwater Bay on the central Queensland coast, but it has not been recollected at or near the type locality. All subsequent Queensland collections have come from the Atherton Tableland or further north.

M. agonis occurs at c. 28° S latitude, some 600 km south of Shoalwater Bay, and 1300 km from the Atherton Tableland.

Conservation status: While it is unwise to make statements about the rarity of small annual plants, this species appears to be truly rare. No other specimens of it could be located in the Queensland Herbarium, despite a search through specimens of many genera in Scrophulariaceae, and even some genera in Rubiaceae and Lythraceae. *M. agonis* has not been found in some nearby areas which have been comprehensively botanised. Lake Broadwater (c. 75 km to the north) has been studied closely (Ballingall 1988). The wetland flora of the Chinchilla area (c. 130 km to the north) has been well catalogued and vouchered, largely through the efforts of local residents G. Lithgow and V. Hando (Hando 1988). The flora of the swamp at the type locality of *M. agonis* is unusual, as it contains tropical species which occur there as outliers, notably *Rotala mexicana* and *R. occultiiflora*, neither of which has previously been recorded for the Darling Downs Pastoral District. Hence there is some reason to predict a small geographical range and population size for the species.

The risk category for *Microcarpaea agonis* according to the criteria of Chalson & Keith (1995) is 'critical' (criteria A, B1, B2, D). The species is known only from the type population, where approximately ten plants were observed. *M. agonis* is under threat from grazing, roadworks and trampling by cattle. The author has searched for *M. agonis* around other nearby swamps, but without success.

The recommended conservation status for this species as defined by the *Queensland Nature Conservation Act 1992* is 'endangered'.

Etymology: The specific epithet is from the Greek *a* - without, and *gonia* - angled, and refers to the fruits.

Acknowledgements

I wish to thank David Halford for helpful discussions, Les Pedley for the Latin diagnosis, and Will Smith for the illustrations.

References

- BALLINGALL, M.E. (1988). Flowering Plants. in G. Scott (ed.), *Lake Broadwater - The Natural History of an Inland Lake and its Environs*. pp. 67–93. Toowoomba: Darling Downs Institute Press.
- BARKER, W.R. (1981). Scrophulariaceae. In J.P. Jessop (ed.), *Flora of Central Australia* pp. 326–334. Reed: Sydney.
- (1990). New taxa, Names and Combinations in *Lindernia*, *Peplidium*, *Stemodia* and *Striga* (Scrophulariaceae) mainly of the Kimberley region, Western Australia. *Journal of the Adelaide Botanic Gardens* 13: 79–93.
- BENTHAM, G. (1869). Scrophulariaceae. In *Flora Australiensis* 4: 470–523. London: L. Reeve & Co.
- CHALSON, J.M. & KEITH, D.A. (1995). *A Risk Assessment scheme for Vascular Plants: Pilot Application to the Flora of New South Wales*. Hurstville: National Parks and Wildlife Service.
- HANDO, V. (1988). Plants of Western Darling Downs, Barakula-Gurulmundi and South-west Burnett. pp. 96–171. In R. Hando (ed.), *Going Bush with Chinchilla Nats*. Chinchilla: Chinchilla Field Naturalists Club Inc.
- MERRILL, E.D. (1923). *An Enumeration of Philippine Flowering Plants, Volume 3*. Manila: Bureau of Printing

Book review

Margaret G. Corrick, Bruce A. Fuhrer, edited by Alexander S. George (1996). *Wildflowers of Southern Western Australia*. Pp. 224. The Five Mile Press, Noble Park. Price \$39.95. ISBN 1 87597 149 1.

This hard-cover publication containing 755 colour photographs of wildflowers from southern Western Australia, is primarily for browsing and enjoying the beauty and diversity of the wildflowers of the region.

The text begins with broad explanation of the landforms, climate and vegetation types of the geographic regions of Western Australia. This provides a more detailed base for the brief habitat information given with each species description.

The species included are arranged alphabetically according to family. A brief description of some of the characteristics of the family is followed by a selection of species chosen to illustrate the variation of colour and form within the family. Each species is numbered and listed alphabetically by scientific name, a common name is given where applicable and a very brief description is provided, along with information on habitat and distribution. This layout allows the browser

easy access to all the information available as each photograph has the species name and number listed beneath it and the corresponding description on the same or opposite page.

The colour photographs, many of which were taken in the field, vary from sharply focussed details of very small flowers to those which give some indication of plant habit. Notable are some excellent close-up photographs of *Verticordia ovalifolia* and *V. oculata* and the selection of *Banksia* species.

A single index at the end of the book is easily found and contains a listing of family, scientific names and common names. Preceding the index is a two-page glossary covering abbreviations and the few botanical terms that are used.

The book is presented as a guide to the wildflowers of the region and as a valuable reference for professional botanists and amateur enthusiasts alike. With its simple, well-planned and presented layout, brief but useful descriptions and the quality and quantity of colour photographs, it achieves this end admirably.

Tracey Spokes

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